



In the obituary notice of Mr. Gustave Bouscaren printed November 11 the statement was made that he had charge of the reconstruction of the Covington & Cincinnati suspension bridge. This is incorrect. The engineer in charge of the work was Mr. Wilhelm Hildenbrand, as is well known to readers of the *Railroad Gazette*. Mr. Bouscaren's work in connection with the rebuilding of the bridge was the remodeling of the anchorages and the repairing of the cable ends where they had been somewhat damaged.

SUBURBAN TRAFFIC.

A considerable extract from the report on suburban traffic prepared by Mr. A. W. Sullivan for discussion at the International Railway Congress and printed in the bulletin of the congress will be found on another page. Mr. Sullivan's method of inquiry was to send a circular containing 100 questions to the railroads concerned with suburban traffic. Of these railroads 129 replied, but only 32 gave the information which forms the basis of the report; yet a casual glance at the list of cities represented shows that the data collected covers all of the most important suburban districts in the country. Including all cities of first magnitude, the report covers 28 suburban services within the United States, one in Canada and three in South America, and it is interesting as a statistical curiosity that the number of passenger rides per year in these 28 United States services is given as 135,802,000, nearly 60 per cent. more than the total population of the United States. The questions which were submitted to the railroads to furnish data for the report are most minute, as may be gathered from the fact that many of the 100 topics are subdivided into four or five parts. It has not seemed advisable to reprint the general discussion of American suburban traffic, for the majority of the information there given is quite familiar to all who know American railroads, and is evidently intended chiefly for the delegates from foreign countries. But, at the risk of repeating familiar figures, the table showing the number of seats per car and the principal dimensions and characteristics of the suburban cars of each of the lines reporting has been given in full, because, although the subject matter is not new to the readers of the *Railroad Gazette*, it is very valuable for purposes of reference.

The table of suburban fares, forming part of the report, is not shown, because the question (No. 9) which was asked regarding suburban rates of fare, single and return, to the chief terminal stations from eight stations distant respectively five to 12 miles from the terminals, was answered by the railroad companies in such a way that the results are misleading. The rates of fare quoted seem in almost every case to be the simple round trip rate that would be accorded to the transient traveler; consequently, the figures shown are so high that they do not at all represent one of the characteristic features of American suburban travel—the low rate on commutation tickets. It is to be

regretted that this question could not have been worded somewhat differently, so that this most full and comprehensive report would have had the minimum commutation fare instead of that of the ordinary traveler's ticket, the price of which is not specially important from the standpoint either of the railroad or of the traveler. It is the transportation which must be used twice a day every week day in the year which interests the suburban resident and builds up or keeps back the growth of "commuter" territory.

With the same fundamental necessities of providing rapid transit from a central location in a crowded city to the suburban residential territory and of providing it cheaply, there are interesting differences in the way the problem is worked out in England and in the United States, the two countries where it is perhaps most strongly felt. The great burden of the British railroads supplying large industrial centers is the requirement that workmen's trains should be run at certain hours of the day, carrying workmen at a greatly reduced rate. As an example of the attitude of the British railroads toward these trains, it is interesting to see that every little while some one gets arrested for traveling on a workmen's train under false pretences, is punished, and the fact of his arrest and conviction is widely advertised by the railroads. In short, they regard the traffic as oppressive and are desirous of doing as little of it as possible, although it is done at rates which compare pretty closely with American commutation rates in the vicinity of the largest cities. But the British workmen's trains run for short distances only, so that the average passenger mile rate must bear a much larger terminal charge than is the case with us. On the ordinary suburban services of the English roads the tendency seems to be rather to give second class accommodations at a rate somewhat less than the regular third class than to greatly increase third class business at a lower rate. The traveler who is unfortunate enough to find himself in a third class car during the morning rush hours can understand the reason for this. Yet, as a matter of fact, it frequently happens that the second class cars in the suburban service are less comfortable than the third class cars found elsewhere, so that the traveler's only gain is in comparative seclusion, and this is chiefly a theoretical consideration in rush hours. In fact, so large a proportion of the British suburban travelers decide every year that they cannot stand third class for their regular trips every day, that on many of the trains second class cars are in the majority during rush hours. The average of British suburban fares is brought down by the sale of workmen's tickets, but there is little doubt that the ordinary British suburban resident pays considerably more for his transportation than does the American. It is unfortunate that the question relative to fares did not call for the minimum, so that the subsequent report dealing with Great Britain could have furnished material for an interesting comparison.

Mr. Sullivan, as is well-known, designed the Illinois Central suburban cars of the side door type, and it is evident throughout the report that he believes them to be the best car possible for this work. He makes

mention of the fact in his report that 100 passengers have been discharged from a car at a terminal station in four seconds, and that ordinary stops at intermediate stations where many passengers leave and enter the trains are made in six to eight seconds. This is certainly a most creditable record. The ordinary British type of car with side doors and transverse partitions, unprovided with an aisle, can discharge passengers with great rapidity, but time is lost in taking them up because of the tendency of the traveler to walk along the car in search of a compartment where he can find a seat. The Illinois Central cars combine the advantage of side doors at frequent intervals with that of the aisle, which enables the passenger to enter wherever he happens to be, and look for a seat while the train is in motion. The following points are among the author's conclusions of the methods to be employed in the working of a suburban service of the most successful type: The arrangements for passengers to go to and from the trains must be short and direct and the station platforms level with the floor of the cars; cars must be of large capacity, with side doors to get the greatest freedom of movement for entrance and exit; provision must be made for the distribution of passengers throughout the train while in motion; the car, as the vehicle of transportation and the primary unit, is the factor to which everything else must conform; in the case of new lines to be built the type of car should first be determined and the railroad then designed to fit the car; the locomotive should be proportioned to handle trains of maximum size at the speed demanded by the train schedule; the greatest train movement and the highest degree of speed and economy in operation are to be obtained by schedules which provide for the movement of trains at uniform speed and stopping at all stations on the same track; separate tracks should be provided upon lines of heavy traffic for trains which are run at high speed and do not stop at all stations.

THE EARNING VALUE OF RAILROAD IMPROVEMENTS.

The enormous sums of money that have been or are being expended by some of the trunk-line railroads, for extensions and improvements in the last few years, has attracted very general attention, and the question is often asked, Will it pay? The benefits and profits resulting from extensions to secure new business, from reduced grades and curvature, from cut-offs to shorten through lines, and from improved track and machinery are usually obvious enough. But this cannot always be said of the very large expenditures often made, the objects of which seem to be the insuring of greater safety of operation, the expediting of travel and business, and the promotion of the comfort and convenience of the public. A noteworthy example is the complete rearrangement and rebuilding by the Pennsylvania railroad of its yards at West Philadelphia, particularly with reference to its passenger traffic. With its many lines entering and leaving Philadelphia through the West Philadelphia yard, including the very crowded tracks of the main lines to New York, to Washington and to the West, the situation had become greatly complicated, particularly

at the grade crossings and points of switching to diverging tracks.

With great ingenuity and engineering skill, the West Philadelphia system of tracks has been reconstructed so that there are no grade crossings either on passenger or freight tracks, each main line having its entrance and its exit unbroken and independent of the others. How this has been accomplished was briefly described in the *Railroad Gazette* of March 27, 1903. While exact figures are not at hand it is safe to say that the aggregate cost of this feature of the West Philadelphia improvements has been in the neighborhood of a million dollars; and a correspondent writes to inquire on what basis the officers of the road can make calculations which will justify such an enormous outlay. Doubtless in planning these improvements, there were in the minds of the officials of the road reasons for incurring this large expense other than those dictated by mere physical utility.

Improvements designed to prevent accidents and to avoid delays to trains, have a tangible value which the engineer and statistician can formulate and estimate with approximate exactness. If it be known from experience that an accident is likely to occur at a given grade crossing once in so many years, and that each such accident is likely to involve damages to life and property amounting to a given sum, it is easy enough to capitalize the value of those losses and to figure what expenditure will be justified in making such accidents impossible. In the case also of train delays, the reduction of grade and curvature, the saving of distance, and numerous other items, their value is capable of more or less exact computation. But the wise modern railroad manager does not stop within the limits of such estimates. He must be more than an engineer and statistician. He must have that rare business judgment or instinct which lies at the bottom of all commercial success, joined with faith and courage in his convictions. In effect this faculty amounts to a correct foresight of what the public, present and future, wants and will buy, whether it be in the matter of calico or of transportation. Improvements of the character referred to, while their physical value receives full recognition, have another value that may be of even greater importance. If the American traveler attaches undue importance to the elements of quick time, punctuality of trains and physical comfort, the railroad manager may deplore, but he cannot ignore it. While to the average railroad passenger the fact that his train is delayed for a few minutes, or that he arrives at his destination half an hour late may be a matter of no practical importance, he will resent it deeply, and may for no better reason transfer his patronage and influence to a rival line. The unavoidable publicity of an accident on any road will prejudice the public against that road to a greater or less degree. Not a few persons have been known to forswear a road because their car was not properly ventilated; or, more frequently, because their meals in the dining car were not satisfactory. On the other hand they may stick like bosom friends to the road that meets their exalted expectations and work like beavers for it. Influences of this character, while apparently trivial, may, in the aggregate, have an important influence upon the business of a

railroad. Knowing this, the wise manager may be amply justified in expenditures which neither arithmetic nor engineering would alone dictate. While money invested to put a road in the best physical condition, to avoid the possibility of accidents, and to prevent delays, may not always be warranted by prospective reduction of operating expense, such investments may be amply justified by increase in net earnings. The wideawake railroad manager understands this and shapes his policy accordingly; and what manager has ever so shaped his policy and not been vindicated?

GROWTH OF RAILROAD BONDING.

Poor's railroad statistics for 1903, recently published, contain two entries of exceptional significance. The total capital stock of American railroad companies is given at \$6,355,207,335, and their bonded debt at \$6,722,216,517, or an excess of bonds over stock of \$367,009,182. Taking the same authority the excess of bonds over stock in 1902 was 387 millions. In 1901 stock and bonds were nearly equal with \$5,978,796,249 for the former and \$6,035,469,741 for the latter. In 1900 stock exceeded bonds by \$45,753,496, and in the year preceding by \$97,323,154. But for the twelve years preceding, except in a single year, we find bonded debt predominating and usually by several hundred million dollars—in 1892 the highest disparity being reached when stock stood at \$4,863,119,073 and bonds at \$5,406,955,004. When we extend the comparison for a period of thirteen years still further back to 1874 inclusive we find for that period no significant disparity in the two sets of securities.

If the figures for issues of railroad bonds for 1904 were available there is little doubt that they would show the ratio of bonds to stocks still mounting higher. "Collateral trust" bonds, "convertible" bonds, debenture bonds and various issues of junior bonds, some with and some without mortgage security, have come out abundantly, to say nothing of the "short note" device so common a few months ago and representing a class of security sooner or later, in many cases, to be refunded into bonds. On the face of the situation it seems extremely probable that the railroads of the country, after a temporary reaction in the direction of stock issues extending over three years beginning in 1899, have again entered a period when bonds will be predominant, and, it may be, predominant in a remarkable degree. Such a situation is worth its brief study both as to causes and results.

Its causes are not hard to find. In the first place a period of railroad consolidation has been attended with extensive issues of new bonds to buy up stocks for control. The process has assumed a number of different forms, but there may be mentioned specifically the "holding" company, sometimes conservative in aims and results, but more often attended with speculative facts or perils. Again, the marketing of new railroad securities, particularly stocks, has had to meet sharp rivalry of other securities pressed for sale. The "industrial" bond with its alluring high return for income has competed sharply with the railroad security. So have the street railway cor-

porations in their effort to secure the funds for fresh enterprise. Finally, not to mention minor causes, the average investor, as distinguished from the mere speculator, has grown keener in his discriminations. While there will always be lambs for "the street" to shear, many of them have grown to be wise sheep and the mere variety and number of the forms of investment pressed upon the man who has the money to buy has educated him in values—an education that has measurably turned him from the railroad share and toward the higher security of the railroad bond. As an illustration of this new attitude of the investor, it will be recalled that the prospective cutting of a "melon" by a railroad company a few years ago lifted the market price of the stock; nowadays it is more likely to depress it. Among intelligent investors the "melon" is not the popular fruit that it was in earlier days of railroad gardening.

Apart from the precedent supplied by the long and, on the whole, decided dominance of bonds over stocks during the period of 20 years before 1899 the forecast suggests a pretty protracted "bond period" in the immediate future. While the funded debts of our railroads have greatly increased it is not to be forgotten that they cover greatly enlarged plants and that a railroad system carries the same amount of debt at from one-half to two-thirds the fixed charge represented by the old 7 and 6 per cent. bonds now almost extinguished by refunding. Consolidation has gone on swiftly but it is by no means ended and the new bonds that purchase control are one of its most familiar marks. Again, the new electric ventures of the great steam lines whether for electric lines or for electric equipment of steam roads, carry the bond theory of the future into large spaces. And it is a forecast to be welcomed rather than feared. While a "bond period" may have its abuses it does not lend itself to them as readily as a time of stock expansion, distribution and bonus; it connotes more conservative financing and a saner form of investment; and, as a token of railroad prosperity, if one looks over the returns of railroad capitalization for almost a third of a century, he will find that, as a general proposition, good times have been coincident with the larger ratios of bonded debt to share capital—albeit panics and crises have betimes played considerable havoc with both.

Gross Earnings for October.

Railroad gross earnings, which first began to show gains in the month of August, still continue to show substantial increases over last year. For the first few months of 1904, owing to strikes and bad weather throughout all sections of the country, railroad earnings received a severe set-back and were, as a whole, far below those reported in the corresponding period of 1903. During the last three months, however, aided by favorable weather and a general revival in business, most of the railroads have been able to show good increases in gross. For the month of October, 87 railroads show a gain of \$2,456,913 over the same month in 1903. This compares with a gain on 91 roads in September of \$2,589,768, and on 87 roads in August of \$1,551,206. Of 65 of the more important railroads reporting earnings for October, 42 show increases and 23 decreases; but the losses, with only a few exceptions, are small.

The increase in traffic during October seems to have been more or less general throughout the country, but the heaviest traffic has been in the Middle and Middle West and trunk line territory. It is rather an unusual state of affairs that the trunk lines should be the first to show the effect of the larger movement of traffic, as the Northwest and Southwest are generally the first to respond to either good or bad influences in traffic. It is undoubtedly a fact that the travel to and from the Louisiana Purchase Exposition has aided materially in increasing the traffic receipts of the east and west trunk lines and of the railroads in the Middle and Middle West. Among the southern roads, the earlier movement and size of the cotton crop has been favorable to larger earnings. In the Northwest, the movement of grain has not been up to what it should be at this season of the year owing to unusually high prices in the grain market at Chicago. These prices have resulted in a large decrease in grain exports to England and have affected adversely the grain traffic of the northwestern

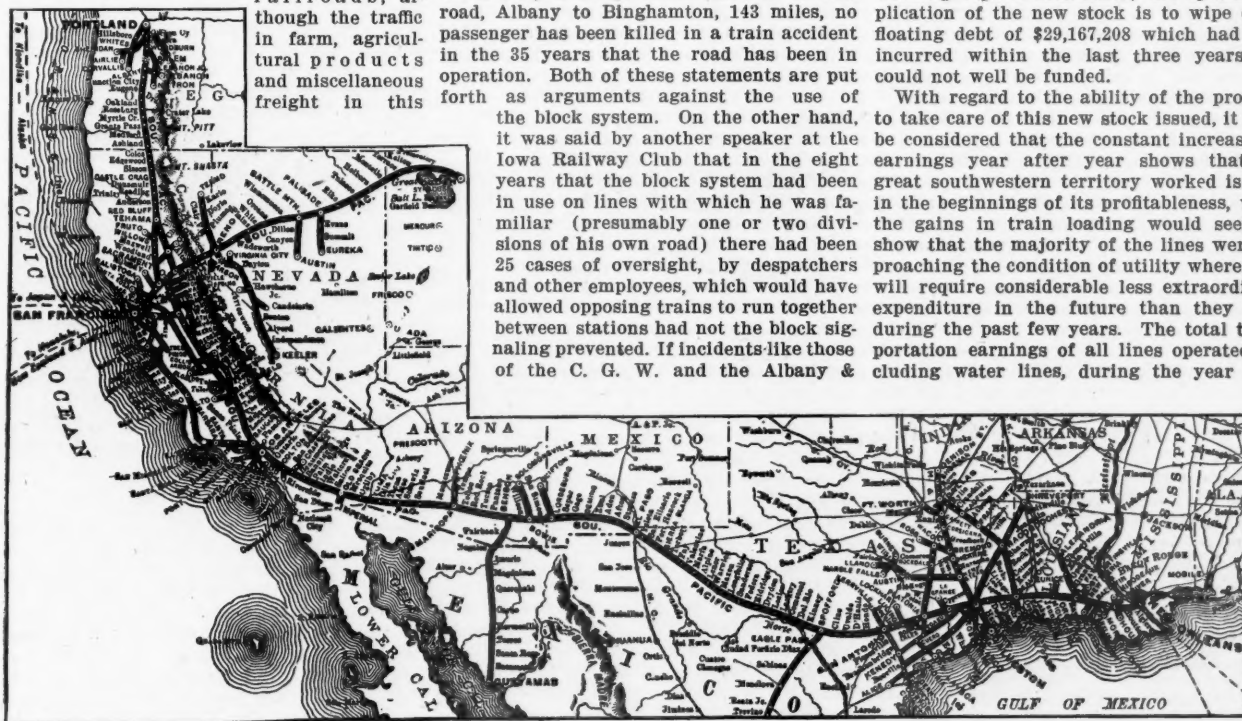
railroads, although the traffic in farm, agricultural products and miscellaneous freight in this

the Central of Georgia, \$147,709. The heaviest loss in receipts was made by the Atchafalaya, Topeka & Santa Fe, which shows a decrease of \$1,026,646 for the month. This was due to the extremely severe floods which occurred during October and which interrupted the traffic of this road for several weeks. Other decreases in earnings reported were: Great Northern, \$224,436; Chicago & North Western, \$175,608; Colorado & Southern, \$78,248; Central Branch (Missouri Pacific), \$55,000, and the Grand Trunk, \$48,313.

At the meeting of the Iowa Railroad Club in October, when the subject of block signaling (reported in the *Railroad Gazette* of Nov. 11) was continued from the September meeting, an officer of the Chicago Great Western said that on one division of that road 360 miles long, no paying passenger had been killed by a train accident in the 18 years since the road was built. The President of the Delaware & Hudson Company has lately published a statement to the effect that on the Albany & Susquehanna division of that road, Albany to Binghamton, 143 miles, no passenger has been killed in a train accident in the 35 years that the road has been in operation. Both of these statements are put forth as arguments against the use of the block system. On the other hand, it was said by another speaker at the Iowa Railway Club that in the eight years that the block system had been in use on lines with which he was familiar (presumably one or two divisions of his own road) there had been 25 cases of oversight, by dispatchers and other employees, which would have allowed opposing trains to run together between stations had not the block signaling prevented. If incidents like those of the C. G. W. and the Albany &

this way been turned back into the property since the commencement of operations in 1885 aggregated over \$100,000,000, as representing the total expenditure for which no securities had been issued. But the complex organization of the Southern Pacific system, with the constant additions and extensions to the proprietary companies' lines, for which the Southern Pacific Company furnishes funds as a suspended asset pending the completion of the work and awaiting a favorable opportunity when the securities so issued in payment for such construction or equipment of other property can be sold at satisfactory prices, creates a need for an exceedingly large working capital. Hence it was resolved last June that the capital stock be increased \$100,000,000, the increase to be of preferred stock subject to non-cumulative dividends not to exceed 7 per cent. per year, the stock being convertible into common stock, share for share, at the option of the holders. Forty millions of this new preferred stock was offered to shareholders on July 28. Besides the general need for working capital mentioned, the specific application of the new stock is to wipe out a floating debt of \$29,167,208 which had been incurred within the last three years and could not well be funded.

With regard to the ability of the property to take care of this new stock issued, it must be considered that the constant increases in earnings year after year shows that the great southwestern territory worked is only in the beginnings of its profitability, while the gains in train loading would seem to show that the majority of the lines were approaching the condition of utility where they will require considerable less extraordinary expenditure in the future than they have during the past few years. The total transportation earnings of all lines operated, including water lines, during the year were



Southern Pacific.

section of the country is better than it was at this time last year.

Earnings when divided geographically show general increases throughout all sections, although the gains are larger in those parts of the country where traffic has been influenced by the favorable circumstances mentioned above. The largest increase is in the anthracite group, where five railroads report a gain of \$1,002,824. Other returns may be summarized as follows: Middle and Middle Western group (13 railroads), increase \$528,429; trunk line group (six railroads), increase \$455,260; Southern group (11 railroads), increase \$743,167; Northwestern and North Pacific group (12 railroads), increase \$105,873; Southwestern group (11 railroads), decrease \$455,416.

Among the separate railroads showing increases in gross, the Reading heads the list, with a gain of \$404,931. Other increases are: Lehigh Valley, \$448,362; Missouri, Kansas & Texas, \$386,511; Wabash, \$336,871; Canadian Pacific, \$255,698; Southern, \$215,670; Pere Marquette, \$191,058; St. Louis Southwestern, \$176,209; Baltimore & Ohio, \$156,647, and

Susquehanna were common they would have a tendency to make block-signal inventors feel like going out of business; but in candor we must say that we have not as yet observed any such tendency, particularly among those inventors who have not yet secured all the capital that they want.

Southern Pacific.

The report for the year ending June 30, 1904, which appears in the admirably full form that has characterized these documents as prepared by Mr. Mahl, shows a property of great strength. It will be recalled that the system has been undergoing a thorough regeneration for a period of several years, involving a vast amount of construction and betterment work entirely apart from the development and strengthening of the water connections. Throughout the recent profitable years the net income has been applied for this rebuilding and re-equipping of the system, and it was pointed out last year that the amount of surplus income which had in

\$92,933,231, an increase of \$4,612,895. Operating expenses during the same period were \$63,179,593, an increase of only \$2,878,333; so it will be seen that the disproportionate increase in operating expenses, which last year made the net earnings smaller than they were in 1902, in spite of the large increase in gross, no longer exists. Receipts over operating expenses in 1903 were \$630,047 less than in 1902; receipts over operating expenses in 1904 were \$1,734,562 greater than in 1903, and \$1,104,515 greater than in 1902. The gains this year were well distributed, but those of the passenger traffic are the most significant. Passenger earnings for the year were \$25,201,488. Five years ago they were \$13,041,860. Since 1899, that is to say, freight earnings have increased 63 per cent. and passenger earnings have increased 93 per cent. The water lines also show a good gain, and the Southern Pacific Terminal Company has developed during the year a business of \$226,301 as compared with less than \$70,000 last year. As regards operating expenses, high wages and new train services have pushed up somewhat the item of

conducting transportation, as was to have been expected, and also that of maintenance of equipment. Maintenance of way and structures cost three-quarters of a million less than last year, owing mainly to the favorable progress which has been made in the betterment work and also to certain abnormal charges on the 1903 account. To the total operating expenses of both rail and water lines, maintenance of way and structures contributed \$12,315,562, maintenance of equipment \$12,050,081, conducting transportation \$32,006,932, and operating expenses of the water lines \$4,818,149. The number of passengers carried, in spite of the gains in earnings, was actually less than last year, but passenger miles increased nearly 81½ millions, the average journey having increased from 77.1 miles to 82.8 miles.

With an average mileage of rail lines of 9,024 as against 8,842 last year, freight tonnage increased from 22,230,367 tons, including company freight, to 23,684,348 tons, and the receipts per revenue train mile increased from \$2.77 to \$2.82, in spite of a slightly less average rate. The increase in train and car loading (the figures including company freight) occurred both on the lines east and west of El Paso, although the most important gain was on the lines west. In 1903 the average train load east of El Paso was 296.9, the average train load west was 335.4, and the average for the system, 320.3. These loadings increased, respectively, to 297.1, 344.2, and 325.5, this year. Per loaded car, the general average was 19.31; last year it was 18.67. The percentage of loaded freight car miles to total freight car miles decreased somewhat, however, the average being 68 per cent. as against 70. This is attributed to the increase in commodities such as oil, where there is no back haul. At the close of the year, 1,555 locomotives were owned, as against 1,468 in 1903; 43,756 freight cars of all types, as against 44,922, and 1,527 passenger cars, as against 1,345. For new equipment, \$2,898,146 was charged against income during the year, to cover 95 locomotives, 120 passenger train cars, 77 freight train cars and 12 road service cars. During the year 251 locomotives were changed to burn oil, making a total of 883 thus equipped.

The following are the principal statistics of the year's operation:

	1904.	1903.
Average mileage	9,025	8,842
Gross earnings*	\$92,933,231	\$88,320,335
Water lines	5,796,423	5,395,048
Passenger earnings	25,201,488	23,558,047
Freight earnings	56,602,651	54,200,659
Total operating expenses* ..	63,179,594	60,301,260
Water lines	4,818,149	4,503,241
Conducting transportation ..	32,006,932	30,056,041
Maint.-of-way & structures ..	12,315,562	13,064,454
Maintenance of equipment ..	12,050,081	10,803,788
Net earnings*	29,753,637	28,019,075

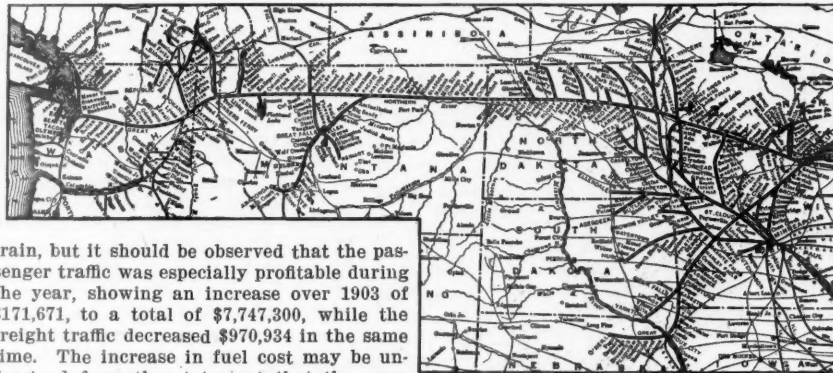
*Including water lines.

Great Northern.

The increase of operating expenses in proportion to gross earnings, which was so prominent a feature of almost all railroad reports a year ago, reached the Great Northern somewhat later than it did the rest of the country. In 1903 the operating ratio on this line, always small, was less than it had been in several years previous. Gross earnings showed a large increase and there was a noteworthy gain in the train load, but for the current year a slight reduction in gross earnings as compared with 1903 was accompanied by an increase in operating expenses, so that the net showing is not quite so good as it was last year, although net earnings are larger than for any previous year except 1903. With an average mileage worked of 5,623 as compared with 5,490 last year, gross earnings were \$40,057,353, as against \$40,785,647 in 1903. Operating ex-

penses were \$20,594,363 as against \$20,076,829, and net earnings were \$19,462,991 as against \$20,708,818, giving an operating ratio of 51.41 this year and of 49.23 last year. The fallacy of depending on the operating ratio as the measure of a road's efficiency has often been pointed out, but where a given property is conducted in the same way for a series of years the figure has some comparative interest.

The disproportionate increase in operating expenses, as has been almost universally the case within the last year or so, occurred chiefly under the head of conducting transportation, and was primarily due to wage increases, additional passenger train service and higher price of coal. The first of these items, that of wage increase, cannot be analyzed because the report does not reduce the conducting transportation charge into its component parts; but the accounts for this year show for the first time the effects throughout a full working year of the increase in wages which the Great Northern, in common with practically all the railroads, made during 1902 and 1903. The item of increased cost owing to train service is principally due to the establishment of an additional daily trans-continental passenger



Great Northern.

train, but it should be observed that the passenger traffic was especially profitable during the year, showing an increase over 1903 of \$171,671, to a total of \$7,747,300, while the freight traffic decreased \$970,934 in the same time. The increase in fuel cost may be understood from the statement that the average cost per ton of coal for locomotive fuel was slightly over 17 cents greater this year than in 1903. The other classified items of operating expenses were kept well in hand, although there is nothing to indicate that too little was charged for maintenance. Maintenance of equipment cost \$3,138,693 as against \$3,109,469 the year previous, while maintenance of way and structures, aggregating \$5,083,264, cost nearly \$190,000 less than in 1903. One specific cause for this economy was the fact that a large amount of permanent bridge work has been done in previous years, so that the annual charge for renewals of bridges and culverts for 1904 was \$230,035 less than the amount charged in 1903. All replacements, renewals, etc., were charged to operating expenses during the year, and the amount placed against maintenance of way and structures as the cost of extraordinary improvements for the year was \$1,410,097. In addition to these maintenance charges it has been customary for several years to set aside a substantial sum out of income as a fund for permanent improvements and renewals, and \$2,000,000 was again appropriated for this purpose, as a direct charge against income, subsequent to the charge for rentals but prior to dividends.

This liberal financing of improvement work out of income has enabled the capital account to be kept well down, and there has been no increase in the amount of stock authorized since the increase of \$25,000,000 voted in 1901 to acquire the securities of seven companies worked in connection with the system. Since that time the authorized capital stock has remained at \$125,000,000, although the purchases have been made as

planned, to an amount close to the present limit. In fact, up to June 30, 1904, the amount paid out on account of the purchase of the securities for which this stock was authorized aggregated \$25,745,053, or \$745,053 more than the proceeds from the issue. The total capital liabilities showed a net increase of \$6,822,726 during the year, the increase consisting principally of £1,500,000 sterling, collateral notes, to provide funds to pay for equipment ordered and construction of new lines contracted for and under way. As against this increase the capital assets show an increase of \$14,569,603.

Train loading, which showed such a marked increase last year, when it was raised from 417 tons to slightly under 447 tons, again shows an increase to 447.4, although the loading per car was slightly smaller. The chief characteristic of the traffic was a serious decrease in wheat and iron ore and a considerable though less important decrease in live stock, lumber and other bulky freight, accompanied by an increase in merchandise and miscellaneous freight. In the face of this fact the increased train load is a particularly good showing. As might have been expected under the circumstances, ton mile revenue was somewhat

higher, amounting to .893 cents as against .857 cents last year. It is interesting to see that with an increase of 8,759,114 bushels of wheat hauled to eastern terminals from stations east of Minot, N. Dak., and north of Garretson, S. Dak., and with a decrease of 1,715,499 tons of iron ore transported, the organization was so flexible that the general freight traffic was handled with a train mileage 581,211 smaller than in 1903, and the revenue train load was actually increased.

The chief operating statistics for the year are tabulated below:

	1904.	1903.
Average mileage worked ..	5,623	5,490
Rev. train-load:		
Gross earnings	\$40,057,353	\$40,785,647
Freight earnings	29,944,300	30,915,234
Passenger earnings	7,747,300	7,575,629
Operating expenses	20,594,363	20,076,829
Conducting transportation ..	10,740,242	10,161,884
Maintenance of equip.	3,138,693	3,109,469
Maint.-of-way & structures ..	5,083,264	5,273,099
Net earnings*	19,462,991	20,708,818
Gross earnings, per mile ..	7.124	7.429
Operating exp. per mile ..	3.663	3.657
Net, per mile	3.461	3.772

*Taxes, \$1,417,980 in 1904, and \$1,474,126 in 1903, not deducted.

NEW PUBLICATIONS.

Elements of General Drafting. By C. E. Coolidge, Assistant Professor, and H. L. Freeman, Instructor of Machine Design, Sibley College, Cornell University. 51 pages and 21 plates, 9 in. x 12 in. John Wiley & Sons, New York. Price \$2.50.

This book is intended for students in manual training schools, trade schools and technical colleges as well as for the amateur drafts-

man. It describes the selection, use and care of drawing instruments and materials. This is followed by directions for making both detail and assembly drawings. The authors evidently assume that the student is already familiar with elementary practice as the basic operations of drafting are not fully explained. The book is illustrated with line cuts only, and not with line cuts and half-tones, as is stated in the preface. The 21 plates in the back of the book show copies of commercial drawings.

Self-Propelled Vehicles, by J. E. Homans, A. M. 672 pages, 5 in. x 8 in., bound in black vellum, gilt top. Theo. Audel & Co., New York. Price \$2.00.

This book gives much practical information in regard to the principles of automobile construction and operation. The theory, construction and operation of the gas engine is clearly discussed in detail, as is also the steam engine and electric motor.

The details of the transmission and controlling apparatus is described as well as different steering devices, under frames, tires, bearings, lubricators, etc. The principle of the storage battery, its construction and care, are also outlined. The last chapter is devoted to "Gasoline Vehicle Management," and it contains practical information and many useful hints valuable to both owner and chauffeur. The volume is liberally illustrated throughout and closes with a complete index.

TRADE CATALOGUES.

The Richards Chair-Panel Company, Chicago, has issued a new catalogue entitled "Backs." The Richards "Fit-the-Back" panel chair was described in the *Railroad Gazette* Dec. 12, 1902. The panel-back feature is applicable to practically any style of chair, 18 of which are illustrated in the catalogue by half-tone engravings. The Pullman Company has used the device in parlor cars since its introduction in 1893, and the Chicago & Alton and the Santa Fe have been using it on limited trains for several years. Besides the illustrations and descriptive matter, the catalogue contains a large number of testimonials from railroad officers and other users of the chairs. A net price list is included.

The Little Blue Flag for November, the magazine of The Lowe Brothers Company, Dayton, Ohio, contains some interesting letters and articles on paint from the salesman's and user's standpoint. There are also illustrations of houses, the exteriors and interiors of which are painted with Lowe Brothers product, and of some effective window displays.

The Standard Paint Company, New York, sends its November issue of "The Exchange." It contains an interesting article on "Valuable Hints to the Roofer." Illustrations of a number of buildings at the Louisiana Purchase Exposition covered with Ruberoid roofing are also shown.

The Stannard & White Company, Racine Junction, Wis., sends its catalogue D. It is devoted principally to locomotive cab seats. The large number and variety of styles of cab seats made by this company are illustrated and described and detailed parts are shown.

The Columbus Machine Company, Columbus, Ohio, sends its special catalogue of gas and gasoline engines in which are described stationary, portable, traction, pumping and

hoisting engines. Detailed descriptions of these engines as well as illustrations of their different parts are also given.

CONTRIBUTIONS

Automatic Signals, Speed Recorders, and Other Things.

Chicago, Nov. 17, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A dramatic derailment which occurred in a large western city not more than a thousand miles from Chicago a few days ago illustrates one advantage of automatic block signals, over non-automatic, that perhaps has not been noticed by all of your readers. A heavy passenger train, while running at high speed through a curve, was derailed, and the engine tumbled over on the adjacent main track; and, as this obstruction short-circuited the signal current through the rails of this track, it set the signal at danger ahead of the train; that is to say, so as to stop trains coming from the opposite direction. As the train was, of course, already protected in the rear (on its own track) by the automatic signals, it was thus instantly protected in both directions. The danger of damage to trains coming from the opposite direction is thus obviated, unless such trains happen to be in the block before the derailment occurs.

This accident also illustrated the usefulness of a speed recorder. On the rear end of the train was the private car of a railroad officer, and in it a speed recorder; this showed, a few moments before the derailment, a speed of 60 miles an hour. As the point where the train ran off the track is on a 10 deg. curve, with super-elevation suitable for moderate speed, the cause of the disaster is not a matter of doubt to those who have looked into the case. We see here plainly the value of an officer's car at the rear of every train, and you will doubtless hear from some daily newspaper editor a recommendation that such an adjunct be regularly required. As everybody knows, the use of a speed recorder on the locomotive is of no value, unless there be a man on the engine detailed to watch it, for the engineman and fireman are always interested, in the case of an accident, in showing that the speed had been very moderate. In the present case, it is safe to say that the engineer would swear that 25 or 30 miles an hour was about the rate at which he had been running.

Whether or not this brilliant (?) exhibition of high speed was the result of an endeavor to add one more to the list of the "unconscious exhibits," for the benefit of foreign visitors to the World's Fair, which have been referred to in your columns, I do not know; but there were numerous passengers on this train returning from the World's Fair and it is safe to say that if any of them were foreigners they were impressed by this little object lesson in American enterprise. Possibly there is not much, after all, in exhibits of this kind, to warrant one in calling them "unconscious." It is hard to believe that an engineer of experience, running over the same road day after day, does not know with considerable accuracy how near the limit of safety he is going when he speeds his engine up to a high rate on a sharp curve. In fact, cases of this kind may fairly be looked upon as furnishing testimony in support of the cynical assertion, lately published very widely in England and America, that our notorious railroad-accident record is due largely to the propensity of the whole nation to do everything too fast. In the last three notable cases of fast trains being derailed on sharp

curves recorded by the Interstate Commerce Commission, the train in each case carried no passengers; it was a "fast mail" or a fast newspaper train. It will be generally agreed, I think, that if this experiment of running at high speed around sharp curves is to be often repeated, to the extent of making it a "test to destruction," the public may fairly demand that the experiments be confined to fast mail trains. If they are to be tried on passenger trains the general passenger agent ought in all fairness to make the situation and conditions clear in his advertisements.

M. G. C.

The Cole Four-Cylinder Balanced Compound.

Urbana, Ill., Nov. 19, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

On a recent visit to the World's Fair the writer observed some things about the New York Central locomotive No. 3,000 which he thinks may be of interest to your readers. This engine is the Cole balanced compound, regarding which the claim is made, in print, that the "four cylinders are so arranged in relation to each other that the horizontal moving or reciprocating parts balance each other without the use of the customary counterweights for these parts in the driving wheels."

The wheel and cylinder arrangement is as follows: Two high-pressure inside cylinders connected to the front crank axle, quartering with each other, and two low-pressure outside cylinders connected to the back drivers as usual in the Atlantic type, set quartering with each other and opposite the cranks on the front axle. The customary counterweights are omitted in the wheels except enough to balance the side-rods and a portion of the cranks on the cranked front axle, which are all rotating parts, hence easily balanced.

As regards forces in a horizontal plane through both axles, the locomotive is balanced; but consider for a moment the vertical forces upon the back pair of drivers alone, when rolling on the track. The conditions here are exactly the same as in an ordinary locomotive; for the vertical forces exerted by the reciprocating parts connected to the front drivers cannot interpose between the back drivers and the rail to balance the vertical forces exerted upon the back drivers by the reciprocating parts connected therewith. It must follow then that the reciprocating parts connected to the back drivers, being unbalanced, and quartering or at 90 deg. with each other, must produce a very severe hammer-blow upon the rails at every revolution. The same reasoning, of course, holds with the front drivers.

If all these cranks were on one axle, or if the two cranks on each axle could be opposite, and similar parts had the same weight, the engine would of necessity be exactly balanced. But the splitting up of the cranks, as done in this engine, between the front and rear drivers, must necessarily result in unbalancing the vertical forces upon each axle. These forces are the ones of importance so far as destructive action upon the rails is concerned.

L. E. MOORE,

Instructor in Mechanics, University of Illinois.

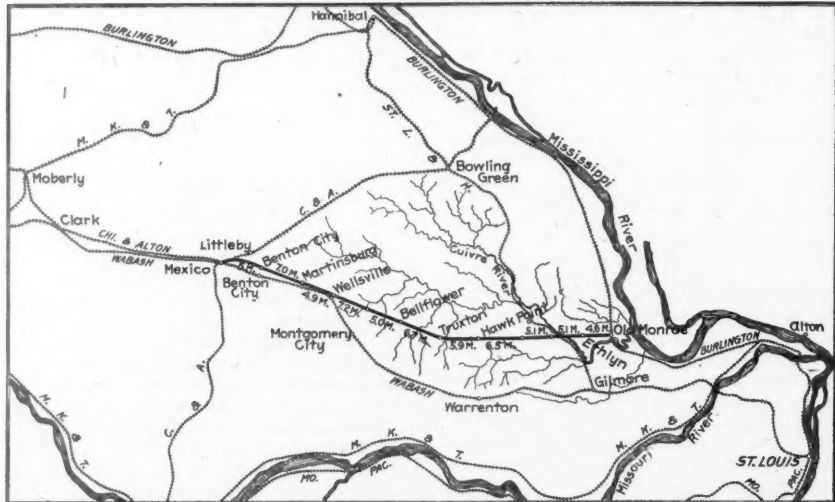
The car-works in Riga are building a number of armored passenger cars for the Chinese Eastern Railroad. With their immense superiority in cavalry, the Russians ought to be able to keep the enemy out of gun-shot of any part of the railroad which they operate. But perhaps these are for use when they invade Japan.

The Old Monroe-Mexico Branch of the Burlington.

BY A. W. NEWTON*

In the competition for control of the rapidly increasing traffic between St. Louis and Kansas City, two of the interested roads have been so seriously handicapped because of the lengths of their respective lines as to make them only secondary factors in that service. The Wabash with 277 miles, the Missouri Pacific with 284 miles, and the Rock Island (just completed) with 296 miles, left the Chicago & Alton, with 322 miles, and the Burlington, with 346 miles, the alternative of either abandoning all effort towards securing their fair share of this business, or of building a short line that would put them on a competitive basis.

A study of the map of Missouri with its various railroad systems showed the possibility of a connecting line for the Burlington and the Alton between Old Monroe and Mexico that would give them the advantages of a short route, and also the benefits to be derived from a road already built and in perfect



Map of Burlington Cut-Off between Old Monroe and Mexico.



Erecting Camp Creek Bridge on Falsework.

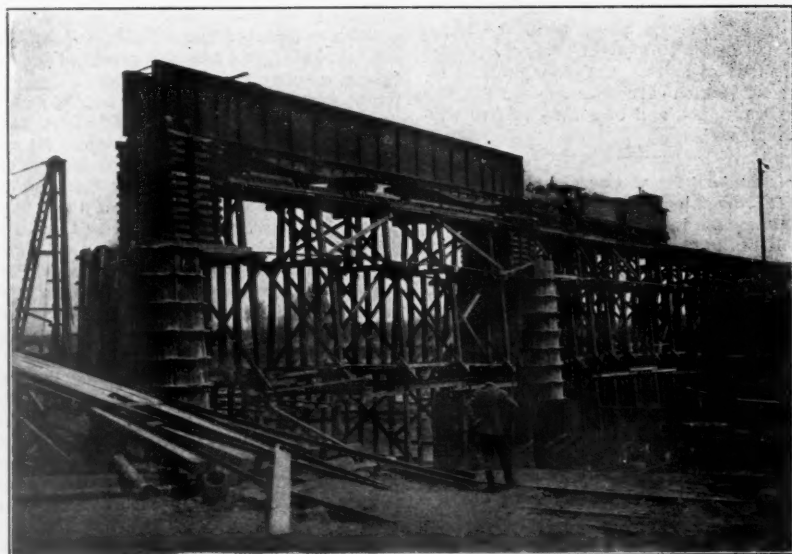
condition, requiring the construction of only 63 miles of new line. The building of this connecting line meant a saving in distance to the Alton of 43 miles and the elimination of that portion of the road having its heaviest grades and greatest curvature; and for the Burlington a saving of 67 miles and also a large amount of heavy grades and sharp curvature.

Location and General Plan.—In August, 1902, a reconnaissance of the country between Old Monroe and Mexico was made covering a territory some 30 miles in width, having in view a location that would be as near an air line as practicable. On October 7, 1902, the preliminary location was begun, which was governed by the following conditions: The projected line should not be longer than 63 miles, the maximum grade should be .5 per cent., the maximum curvature should not be more than 2 deg. and should not be more than 10 per cent. of the total length of the line to be constructed, thus insuring a low-grade and practically an air line. On Dec. 23, 1902, the preliminary surveys were completed and an estimate of the cost was made at \$42,000 per mile. On March 27, 1903, the final location

*Superintendent of Construction.

of the line was begun under the direction of Chief Engineer Breckenridge, of the C., B. & Q., which road was to construct, own and operate the cut-off. The line of preliminary location was abandoned and a new line established that effected a considerable saving in grading and bridge construction, and yet did not materially add to its length. This location gave a total length of 63.18 miles.

The location decided upon required a long maximum grade extending from the Cuivre river west for seven miles through a deep cut, also the construction of large bridges at Cuivre river, Camp creek and Bear creek. At the Cuivre river the entire drainage of the line is concentrated as all waterways along the road eventually empty into this river. For the first nine miles an undulating grade line was laid out on which borrowing and wasting was avoided except on mile 9, where considerable borrow was necessary through the Cuivre bottoms. Then followed the seven miles of ascending grade above mentioned, necessitating deep cuts and the wasting of many thousand yards of excavation. Miles 18 to 27 are through a rolling country where cuts and fills could be readily balanced. Miles 27 to 32 presented the most serious difficulties on the entire line. Crossings for Clear branch, Camp creek and Bear creek had to be located and



Erecting 105-ft. Plate Girder over Cuivre River.

each presented an obstacle in itself. Here a careful study of the topography of the country showed a physical condition which was most fortunate. High grade crossings were necessary in order to maintain a low-grade line and also to avoid as much excavation as possible. It was, therefore, necessary to find the narrowest places in the valleys of the three streams mentioned. These points were located and found to be

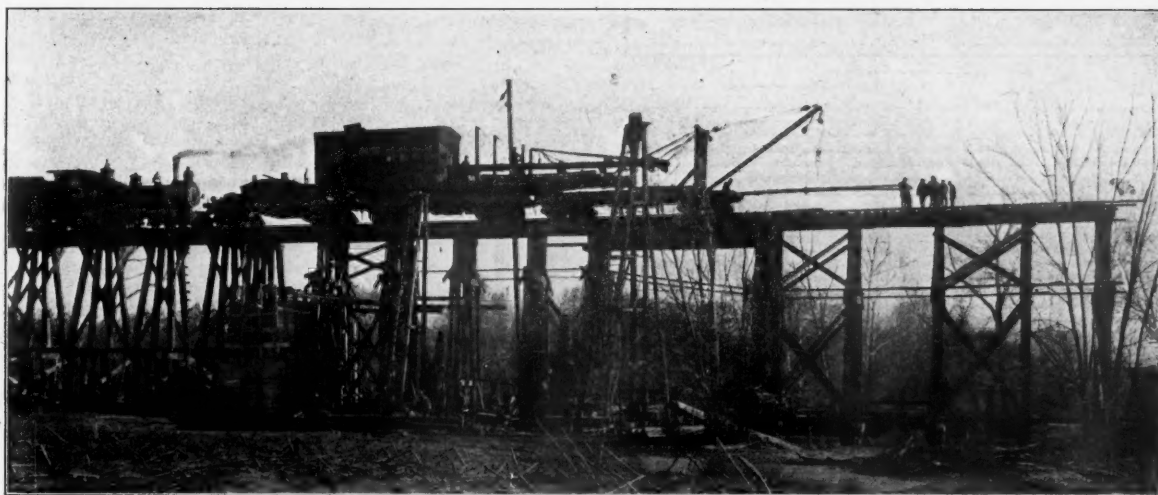
not far from the general line of location so that with the introduction of a very little curvature the line as originally laid out could be carried across these narrow places. From mile post 32 to mile post 63 but little difficult work was encountered and the line was located as a tangent the whole distance with the exception of one short 1-deg. curve on mile 45.

The final location was determined by April

28, 1903, and orders were given to have the line in operation by June, 1904, in order to participate in the expected large traffic to and from St. Louis for the World's Fair. The first right-of-way was purchased in May, 1903, and the contract for the grading was let by Chief Engineer Breckenridge to the Stubbs, Flick & Johnson Construction Company, of Kansas City, on May 22, 1903. On June 8, 1903, the first work of construction



Excavating Rock Cut near Camp Creek with Steam Shovel.



Pile Driver Derrick Car Erecting Falsework for 105-ft. Girder over Cuivre River.



Completed Plate Girder Bridge over the Cuivre River.

began. In 12 months time this company undertook to complete 3,200,000 yds. of excavation, haul overland from two to 20 miles and lay 756 tons of cast-iron pipe, construct 11,500 yds. of standard concrete-steel box culverts, erect 650,000 ft. (board measure) of pile and frame bent bridges, erect eight steel bridges and lay and ballast 63 miles of track, besides construction of terminals, reservoirs for water supply and the erection of depots and station buildings. At the end of the 12 months, after having experienced extremely unfavorable weather, the work was 92 per cent. completed.

A force of nine steam shovels and 33 sub-contractors having each from one to eight miles to grade, was put upon the work as rapidly as the outfits could be secured. From a total of 18,500 yds. in June, 1903, the excavation was increased to 509,000 yds. in October and 520,000 yds. in November, while at the same time large forces were at work on pipe culverts, putting in concrete and erecting bridges so as to avoid delays to grading.

Construction.—The low-grade line and minimum amount of curvature, and the rolling nature of the country, made deep cuts and heavy fills a necessity. As already stated, nine steam shovels, which varied in size from 35 tons to 65 tons, were placed on the

ception of the connection with the St. Louis, Keokuk & Northwestern at Old Monroe, where a 2-deg. curve was used, all curves on the line are either 1-deg. or 30 minutes, and the percentage of curvature is less than 10 per cent. of the whole line.

Momentum grades were introduced at four points on the line, based on a train velocity of 30 m.p.h. at foot of grade. The introduction of these grades saved a large amount

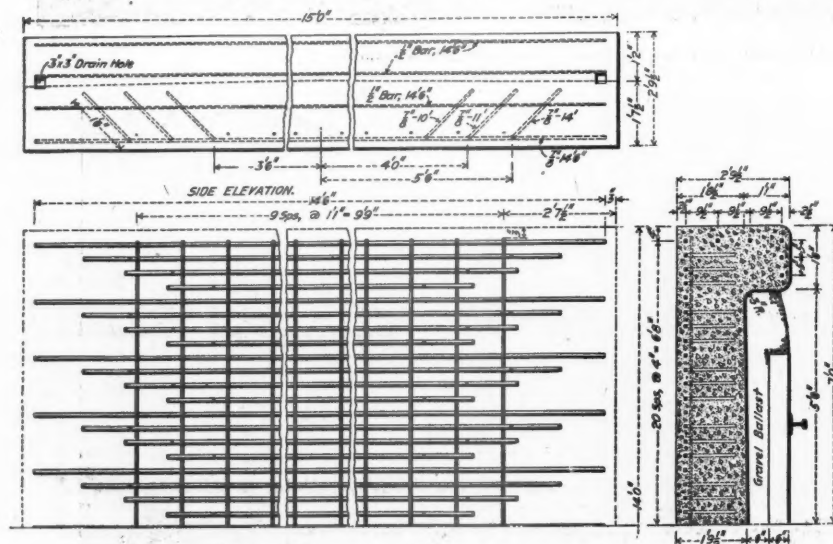
of heavy filling. Trains are being operated over these momentum grades with loads based on a maximum of 5 per cent. grade.

Provision for Drainage.—Cast-iron pipe was used in sizes up to 48 in., both single and double strings, and under fills not exceeding 20 ft. In all cases requiring more opening than would be afforded by a double string of 48-in. cast-iron pipe, or where fills were higher than 20 ft., concrete-steel box culverts were built. These boxes were designed by the bridge department of the Burlington, and the corrugated bars of the St. Louis Expanded Metal Fireproofing Company were used with excellent results. No cracks in the concrete due to settlement or other causes have appeared. These boxes varied in size from 4 ft. x 5 ft. to 14 ft. x 14 ft., the largest being built at Clear branch under a bank 65 ft. high. The drawings of this culvert are reproduced herewith. It rests on a concrete gravel foundation, no extra excavation being necessary. The box is 213 ft. long and was built in two sections. It has been subjected not only to the strain of having a very large fill built over it but also to the shearing and crushing effect of an immense slide on the north end, without showing any signs of weakness, and after having sustained the weight of the finished roadbed for about six months is in perfect condition. Excellent conditions exist along the entire line for foundations, which in a measure accounts for the exceptional results in concrete and concrete-steel structures, not one of which shows a crack or sign of settlement.

Bridges.—Besides three girder bridges for



West Approach to Camp Creek Bridge, 87-ft. Fill.

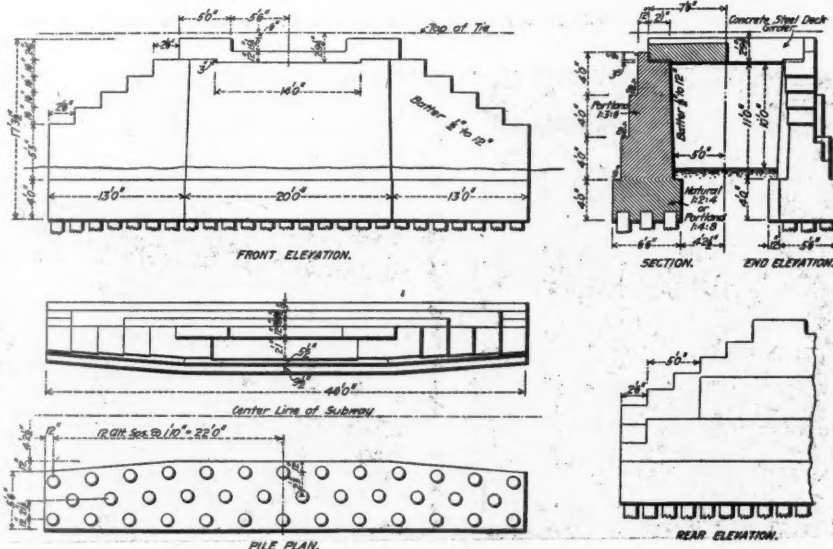


Reinforced Concrete Deck Girder Slab.

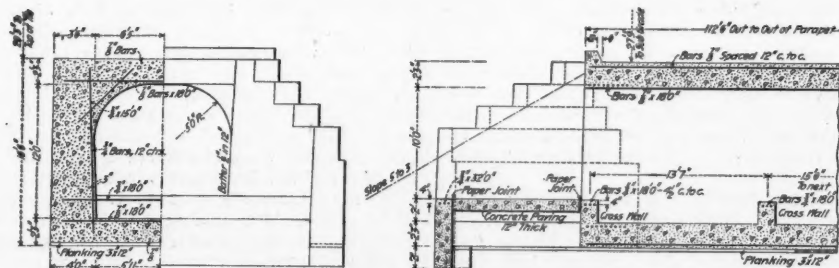
work. Five of these shovels were transported overland an average of 14 miles, and this movement was greatly facilitated by the use of Michael's patent device for handling track on which to move the shovels. This improvement, which is owned by Mr. Johnson, of the Stubbs, Flick & Johnson Construction Company, proved itself to be an excellent labor and time-saving device for steam shovel contractors.

The general plan outlined for the completion of the line was for grading to be done on the east nine miles by Jan. 1, 1904, and the west 18 miles by Nov. 1, 1903, so that tracklaying and ballasting could be carried on while grading was being completed on the remainder of the line. Material for bridges and tracklaying was divided between the two terminal points and forces organized to work from each end. A Harris tracklaying machine was used on the entire line with an average force of 75 men. One mile of track per day was the average amount laid.

A reference to the accompanying map of the line will give an idea of the alignment and also show how nearly an air line was obtained in the final location. With the ex-



Concrete Girder Bridge for Highway Subway.



Reinforced Concrete Box Culvert, 10 ft. x 12 ft.

highway subways, bridges for waterways were erected at Cuivre river, Camp creek, Bear creek, Wolf creek and Elkhorn creek, the last two being 50 and 75-ft. deck plate girders respectively. Bear creek and Camp creek bridges are composed of deck plate girders supported on steel towers, the height of the structures prohibiting the erection of concrete piers.

The erection of the Cuivre river bridge was attended with a continued succession of difficulties incident to the sudden and frequent high waters for which the Cuivre is noted. The bridge is composed of three 105-ft. and two 70-ft. deck plate girders supported on concrete piers carried down to bed rock. The erection of this bridge was begun in November, 1903, and was not completed until June, 1904. The concrete work was done by the Foundation & Contracting Company of New York. With a record of fourteen high waters and overflows to contend with, each of which caused work to be entirely suspended, it is easy to understand why so much time was consumed in building this bridge. Falsework used by the contractors, and also that erected by the railroad company for placing

the steel girders, was wrecked and washed away four times.

Soundings for the piers showed a stratum of gravel below the bed of the river, 25 ft. thick, and extending to solid rock. Friestedt interlocking steel sheet piling was used in sinking the caissons and very little pumping was necessary to keep the caissons free from water. The sheet piling was driven with a heavy steam hammer, about four minutes being required to drive each pile after being set in position.

In excavating for foundations a good quality of angular creek gravel was encountered, which when washed was used in the footing courses of the concrete, effecting a saving of several hundred yards of crushed rock. One of the illustrations shows this bridge during erection.

Track.—The track is laid with 33-ft., 85-lb. steel rails and 20 ties to the rail. Oak and cypress ties were used, the majority being oak. About seven miles of cypress ties were laid, on all of which tie plates were used.

Terminal Yards.—At Felton, two miles east of Mexico, about 60 acres of land adjoining

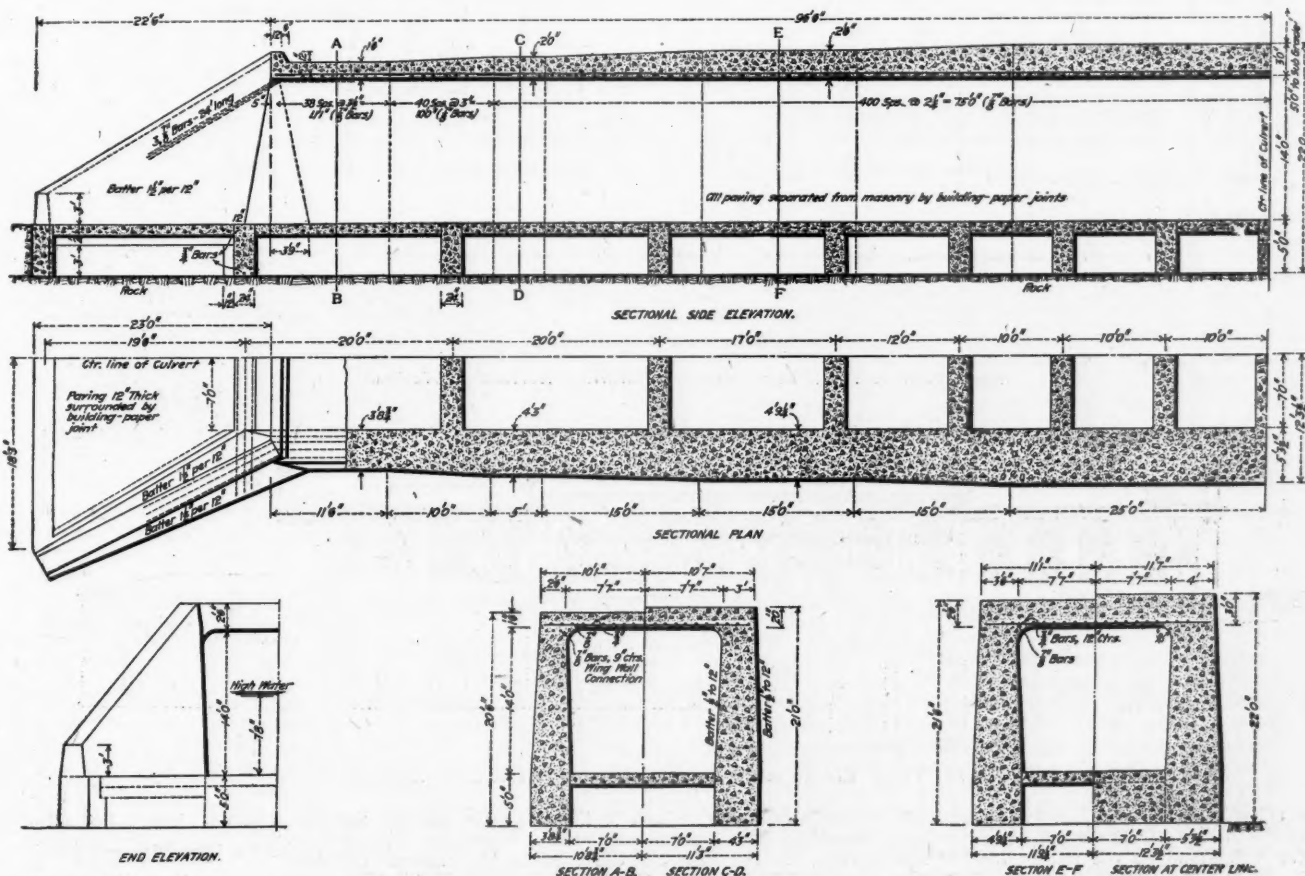
the Chicago & Alton were purchased for terminal uses. The plans at this point called for yards 4,000 ft. long, and a roundhouse, coaling station, water station, and other structures necessary for a terminal to be used by two roads where interchange of crews is made in a joint service. The water supply at Felton was increased from 27,000,000 gallons to 64,000,000 gallons by building a second reservoir so that there is now an ample quantity available.

Interlocking plants are being installed at Old Monroe, where connection is made with the St. Louis, Keokuk & Northwestern, and at Felton, where connection is made with the Alton. A standard design of depot has been erected at each of the ten stations along the line. They are both substantial and attractive and convey some idea of the thorough manner in which the entire road is built.

Ballast.—As a temporary ballast to be used until the roadbed is sufficiently settled, gravel and burnt mine refuse has been put in with satisfactory results. It is possible to raise and surface the track rapidly with this material and line and surface are easily maintained. On top of this sub-ballast a finishing coat of 8 in. of crushed rock is to be laid during the coming winter so as to have the roadbed in better condition to stand the service during the wet weather of next spring.

Owing to the peculiar nature of the soil on which the line is constructed it was decided that the slope in cuts as well as on fills should be made $1\frac{1}{2}$ to 1; the roadbed to be 20 ft. wide at sub-grade and the total width in bottoms of cuts to be 27 ft. This is in excess of Burlington standards but was deemed necessary in this case.

On October 1, last, the road was turned



Reinforced Concrete Box Culvert over Clear Branch.

over to the operating department ready for service on a 30-m.p.h. basis, which has been maintained since then, all trains of the Burlington and the Alton between Kansas City and St. Louis running over this cut-off.

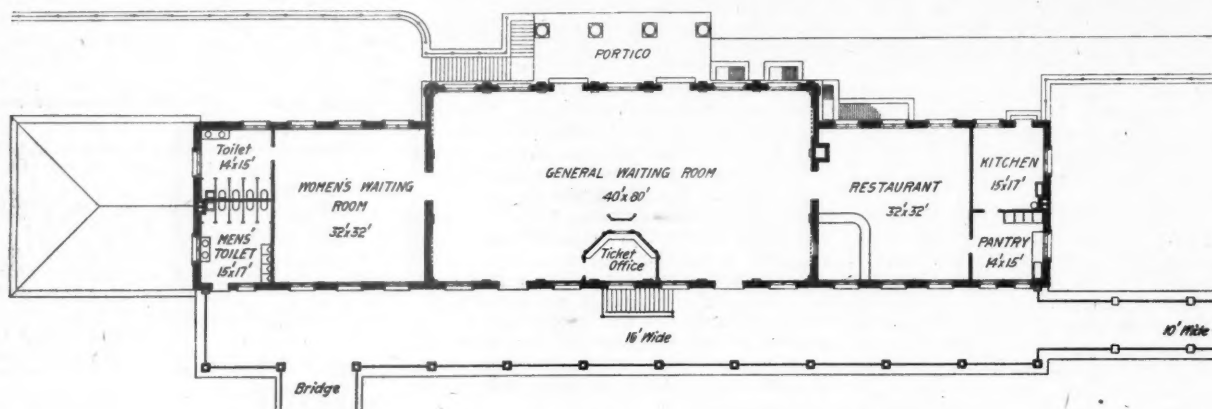
Norfolk & Western Station at Roanoke.

In addition to the extensive freight terminal and shop improvements which the Norfolk & Western has recently completed at Roanoke, Va., it is also building at that city a new passenger station which when com-

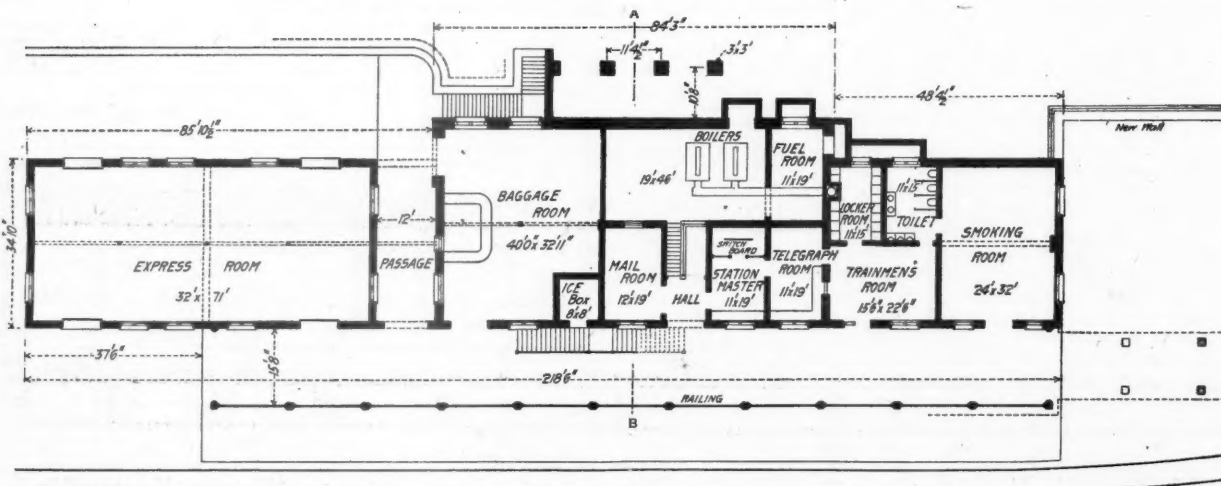
pleted will be one of the most handsome buildings of its kind in the South. The new station will stand on the site of the old station at the intersection of Shenandoah avenue and Randolph street, and will face north on a wide plaza opposite the large park and

grounds of the Hotel Roanoke. The tracks in front of the station run in a cut from 15 to 20 ft. deep and the new building will be two stories high on the track side but only one story above ground on the back side. It is a fine example of Colonial architecture as will be seen from the accompanying illustrations from the architects' drawings.

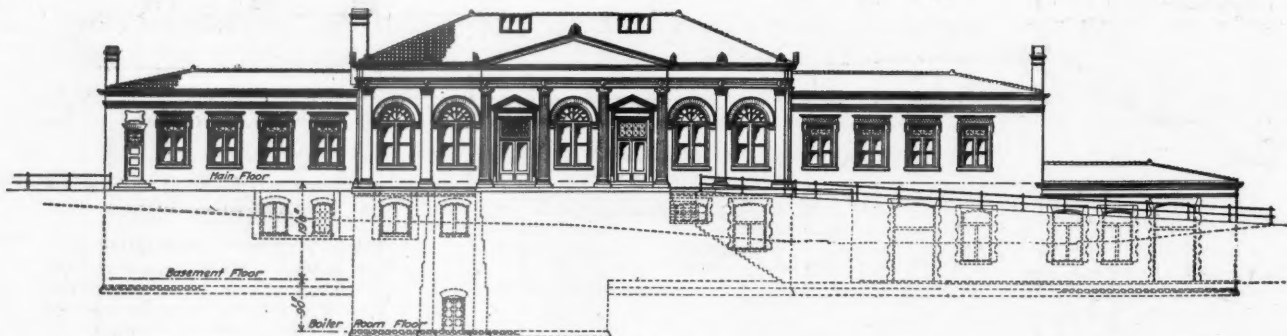
The top floor is level with the new grade of the plaza which has been established, and is 181 ft. long. The main waiting room occupies the center of this floor and is flanked by low wings on each side, in one of which from the paved court around the west wing of the station at the track level leads into the side of the portico and a wide granolithic walk along the eastern end of the building at the street level opens into the other side. The main waiting room is 40 ft. x 80 ft. and is finished with paneled wainscoting, plaster walls and fluted wooden pillars flanking the doors and windows. It is 22 ft. high from the floor to the paneled ceiling, which is supported on the bottom members of the steel roof trusses. Skylights in the roof over light wells closed at the bottom with ceiling lights provide for ven-



Ground Floor Plan of Norfolk & Western Station at Roanoke, Va.



Floor Plan at Track Level, Roanoke Station, Norfolk & Western.



North Front Elevation of Roanoke Station, Norfolk & Western.

pleted will be one of the most handsome buildings of its kind in the South. The new station will stand on the site of the old station at the intersection of Shenandoah avenue and Randolph street, and will face north on a wide plaza opposite the large park and

is the women's room and in the other the restaurant and kitchen. A wide Colonial portico, the full height of the building, and supported by four massive fluted stone columns forms the main entrance to the general waiting room. A stairway running up

tilation and top lighting. The ticket office is directly opposite the main entrance against the wall.

At the western end of the waiting room is the women's rest room, 32 ft. x 32 ft., and toilet rooms for men and

women. The women's toilet opens off from the rest room and the men's toilet opens from the gallery leading along the outside of the building on the track side. At the east end of the building is the restaurant, 32 ft. x 32 ft., and the kitchen and pantry are next to the east wall, where there will be no trouble from odors. Both the women's room and restaurant are finished with a low wood wainscot and plaster walls with ceilings 15 ft. high.

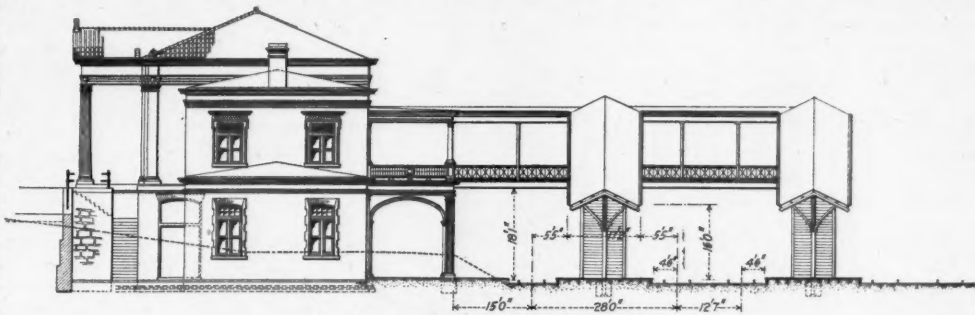
On the lower floor, which is about at the level of the tracks, are the express room, 32 ft. x 71 ft.; baggage room, 40 ft. x 32 ft. 11 in.; mail room, 12 ft. x 19 ft.; boiler room, 19 ft. x 46 ft.; station master's office, telegraph office, trainmen's room, fuel room, smoking and another men's lavatory. The express room extends out beyond the west wing 37 ft. 6 in., and is covered with a low roof that comes a little above the parapet of the retaining wall of the excavation in which the station stands. It is separated from the other rooms on this floor by a passageway 12 ft. wide running through the building from the train platform to the foot of the stairs leading down from the portico. The checking counter in the baggage room is reached from this corridor. Double swinging doors lead out from the baggage and express rooms to the inside train platform and runways for trucks over the tracks will be provided to reach the other platforms. The paved court or driveway in the rear of the express room connects with the street beyond the station where the ground slopes off.

The train platforms, of which there are three, are 19 ft. wide. The single platform next to the building is granolithic paving, but the double platforms are wood laid on stringers bedded in cinders. They are 780 ft. long and the two double platforms are covered with umbrella sheds 17 ft. 2 in. wide at eaves, sloping from the ridge down to the sides. The inside platform is

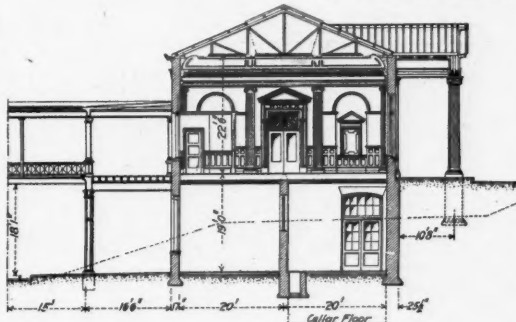
metal columns. It is expected to have the station in use by next February.

Frye & Chesterman, Lynchburg, Va., were the architects, and the contract for all of the work has been let to John P. Pettyjohn & Co., of the same place. We are indebted to Mr.

which will differ from usual practice is that the traveler will be outside of the trusses instead of inside. When it reaches the main pier it will be necessary to provide special cantilever floor-beams to carry it. There will be three lines of stringers under the



West End Elevation, Roanoke Station.



Section through Center of Building.

C. S. Churchill, Chief Engineer of the Norfolk & Western, for the drawings and information.

The Quebec Bridge.

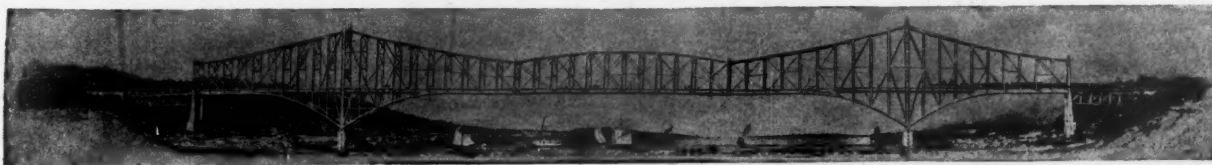
The illustration shown herewith is from a photograph of a model of the bridge of the Quebec Bridge and Railway Company across the St. Lawrence river near Quebec, Canada, now under construction. This bridge, it will be remembered, is the longest span steel bridge in the world. It has a central span of 1,800 ft., two anchor spans of 500 ft. each, and two approach spans of 210 ft. each. The width is 80 ft. between

traveler, and these same stringers will later be used under the railroad tracks in the permanent structure.

At the present time the masonry piers and the two approach spans of the bridge are done, and practically all of the falsework for one anchor arm is in place. A considerable part of the anchor arm has been shipped and has been stored at the site ready for use. The steel falsework for the traveler has all been shipped and is mostly in place. This steel weighs 1,100 tons. Owing to climatic conditions, it is only possible to work on the bridge about seven months in the year, work for 1904 having ceased at the end of October. It is expected to complete the bridge in four more seasons.

In order to accommodate the material for one-half of the bridge a storage yard 3,000 ft. long and spanned by a 70-ft. crane is required. An idea of the size of some of the members of the bridge may be gained from the statement that the main posts are 325 ft. high and each one weighs more than five ordinary 150-ft. single-track railroad spans. The bridge was designed by Mr. P. L. Szlapka, Designing Engineer of the Phoenix Bridge Company.

The model from which the photograph was made is on a scale of 1 in. to 40 ft. and is 9 ft. long over all. It is made of paper and formed part of the exhibit of the



Bridge of the Quebec Bridge & Railway Company over the St. Lawrence River.

protected only for the length of the station building by the gallery 16 ft. wide next to the wall.

The trains can be reached from the main waiting room on the upper floor through the two double swinging doors opening out on the covered gallery and over the bridge at the west end to the stairs leading down to the platforms below. Or, the inner platform can be reached from the upper gallery by the stairs along the wall between the doors leading out from the main waiting room. The passageway between the baggage and express rooms also forms another entrance and exit.

The walls of the building are pressed brick with stucco, stone and terra cotta ornamentation around the windows, and the roof is fluted tile. The bridge over the tracks and the covered gallery are wood, supported on

centers of outside railings, and it will carry a double-track railroad, two lines of trolley tracks, two highways and two sidewalks. The clear height at high water is 150 ft. The weight of the structure is 35,000 tons.

The bridge was of such magnitude and contains so many new features that the Phoenix Bridge Company, which designed and is building it, found it desirable to make a model in order to design the traveler. This traveler is built of steel and weighs 450 tons. It is 217 ft. high over all. Contrary to usual practice no steam hoisting engines will be used on the job, electricity being used instead throughout. The Lidgerwood Manufacturing Company has made special electric hoisting engines, weighing about 35 tons, for use with the traveler. The traveler will be carried on steel falsework, the first ever used, so far as we know. Another point

Phoenix Bridge Company at the World's Fair, for which the company was awarded the grand prize.

Rebuilding the Oregon Railroad & Navigation.

The Oregon Railroad & Navigation Company, with headquarters at Portland, Ore., has 1,128 miles of track in Oregon, Washington, and Idaho, on which, since the company was reorganized in 1896, large expenditures have been made for improvements and betterments, consisting of radical changes of line, elimination of trestle bridges by filling or throwing out by change of line, substitution of steel for wooden bridges, replacing wooden culverts with cast-iron pipe, relaying with heavy rail, and ballasting. The following information briefly covering

this work has been received from Mr. E. E. Calvin, General Manager.

The main line of the O. R. & N. extends from Portland to Umatilla, Ore., where it forks, the line running east terminating at Huntington, Ore., and forming a junction with the Oregon Short Line; the line running north terminating at Spokane, Wash., forming connection with the Great Northern. An important branch line extends from Tekoa, Wash., to Wallace, Idaho, handling

property, but since the date of reorganization the policy has been to eliminate trestle bridges by filling and to substitute steel for wooden bridges at stream crossings, as fast as the revenues would admit.

The following is a brief summary of improvements made during the fiscal year ending June 30, 1904:

There were erected 19 steel bridges (designed to carry modern heavy loads) consisting in all of 25 spans, varying from 20

ft., and requiring 143 cu. yds. of concrete masonry.

The improvements to track during the fiscal year consisted of laying 48.03 miles of 80-lb. rail, replacing rail of lighter weight, and ballasting 32.22 miles of roadbed. Many permanent improvements have been made since 1896, the summary of which is as follows: There have been eliminated by filling, or thrown out by change of line, 373 bridges, aggregating 58,108 ft., equal to about 11 miles. It required 2,161,921 cu. yds. of embankment for the new roadbed so created. Seven hundred and twenty cast-iron pipe culverts were placed under filled bridges or through worn out wooden culverts, with an aggregate length of 38,255 ft. transverse to the roadbed, equal to 7.2 miles. Fifteen concrete arch culverts were built, with a total length of 1,333 ft., requiring 5,431 cu. yds. of concrete masonry in their construction. Sixty-one steel bridges were erected, with an aggregate length of 5,394 ft., requiring 27,477 cu. yds. of concrete masonry in the construction of abutments and piers, and 4,509 tons of metal in the superstructures.

Twenty-six separate changes of line were made, the length of original line changed being 48.57 miles, and the amount the line was shortened being 1.34 miles. The curvature eliminated consisted of 196 curves, aggregating 5,891 deg., or over 16½ complete circles.

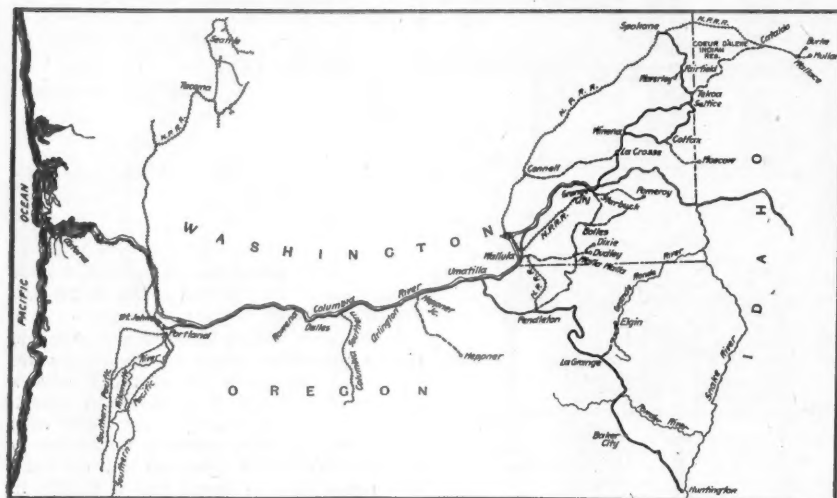
During the same period light rail was replaced with rail of heavier weight as follows: 152.20 miles of 75-lb. steel rail; 204.49 miles of 80-lb. steel rail; 38.13 miles of 85-lb. steel rail; 13.22 miles of 90-lb. steel rail. Ballasting done during the same period consisted of 25.46 miles.

The management intends to continue making improvements to its roadbed as fast as it is practicable to do so, having under consideration for 1905 the erection of several steel spans, the elimination of a number of trestle bridges, and extensive ballasting of track.

Since receiving the foregoing from Mr. Calvin press despatches have stated that work has begun on a new branch from Arlington to Condon in Gilliam County, Ore., 46 miles. The contract, it is said, stipulates that all of the bridge and track work shall be completed by December 31.

New Passenger Locomotives for the Lake Shore.

The Lake Shore & Michigan Southern has just put into service ten new Prairie (2-6-2) type passenger locomotives built by the Brooks Works of the American Locomotive Company. These new engines are heavier and more powerful than any heretofore used by the Lake Shore in passenger service. Train loads and speeds on this road have increased at such a rate that the class J



Map of Oregon Railroad & Navigation Company's Lines.

Full lines show main line; dotted lines show branches.

the output of the Coeur d'Alene mines. A number of other branch lines tap the agricultural and mining districts of Oregon, Washington and Idaho.

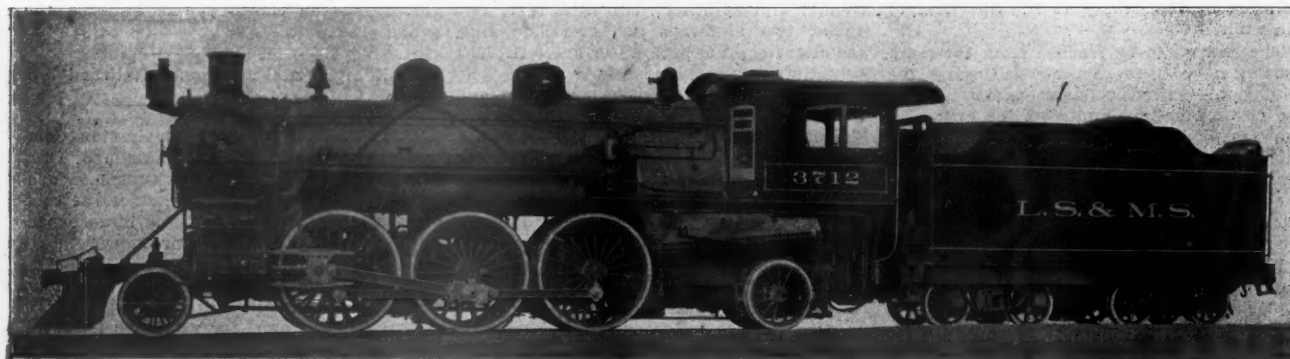
The number and magnitude of waterways crossed can be appreciated by the statement that there are in all 68 iron and steel bridges, aggregating 8,697 lineal feet, 35 Howe truss bridges, aggregating 3,928 lineal feet, and 860 pile and frame trestle bridges, aggregating 110,899 lineal feet. The most important structures are the steel drawbridge crossing the Willamette River at Portland and a similar bridge crossing the Snake River at Riparia. Several large streams are crossed a number of times. Between Umatilla and Huntington there are seven crossings of the Umatilla River, 18 crossings of Meacham Creek, two crossings of the Grande Ronde River, three crossings of Powder River, and 33 crossings of Burnt River. Between Colfax and Spokane there are two crossings of Palouse River, and four crossings of Latah Creek. On the branch line between Colfax and Moscow there are 18 crossings of the South Palouse River, and on the branch line between Tekoa and Wallace there are four crossings of the Coeur d'Alene River.

Some small amount of bridge filling was done before the present owners acquired the

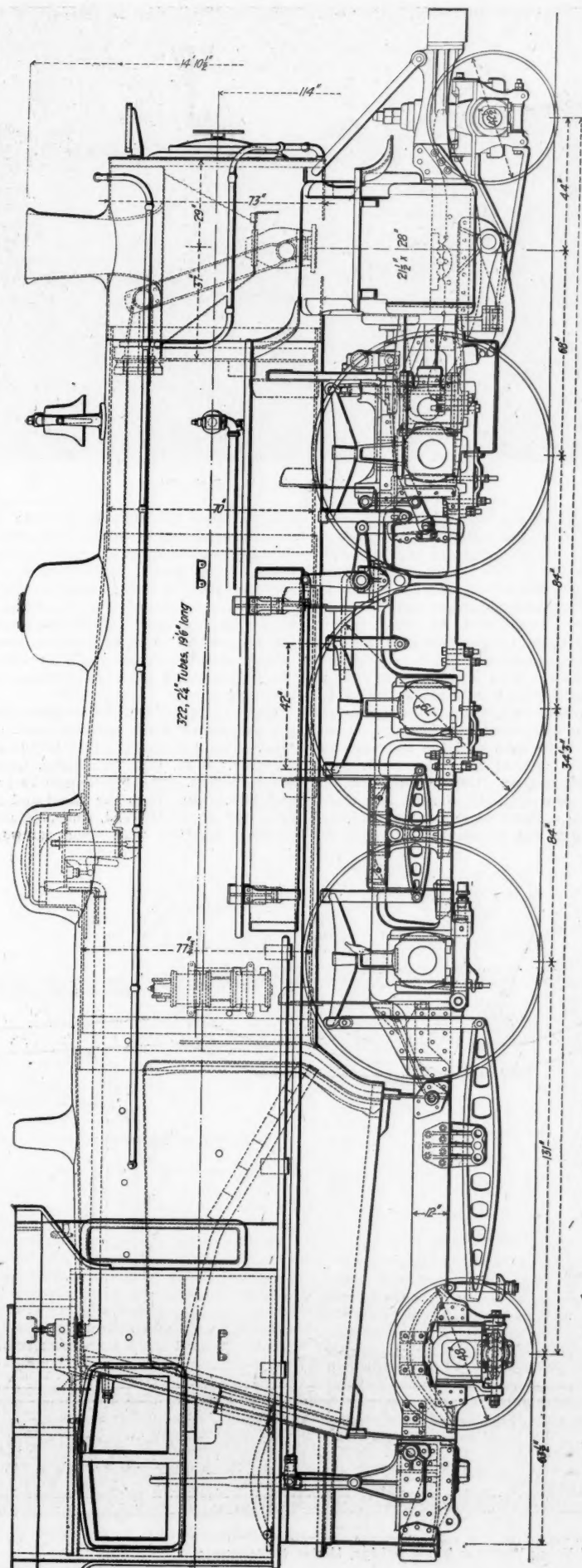
ft. to 200 ft., with an aggregate length of 1,986 ft., all supported by concrete abutments and piers in which 8,920 cu. yds. of concrete masonry were required for their construction.

The most important bridge erected during the year is known as A 206, crossing the Spokane River at Spokane, Wash. It consists of three 150-ft. through lattice truss spans, and one 35-ft. and one 65-ft. through plate girder, resting on two abutments and four piers. Another important bridge, known as E 45, was erected at Cataldo, Idaho, crossing the south fork of the Coeur d'Alene River. It consists of one 200-ft. through pin-connected truss and one 50-ft. through plate girder, resting on one abutment and two piers. There were also erected two 125-ft. through lattice truss spans, known as bridges E 52 and E 85, crossing the south fork of the Coeur d'Alene River. One 125-ft. through lattice truss, known as bridge R 155, was erected on Meacham Creek. Five through plate girders of 80-ft. span were erected on Burnt River.

Eighty-three cast-iron pipe culverts have been placed transverse to the track under filled bridges or through worn out wooden culverts, aggregating 3,840 ft. in length. One arch culvert was built, its length being 41



Prairie (2-6-2) Type Locomotive for the Lake Shore & Michigan Southern.



General Elevation of the Lake Shore & Michigan Southern Prairie (2-6-2) Type Passenger Locomotive.

locomotives (see *Railroad Gazette* March 20, 1901,) which were designed only about four years ago, have become inadequate, the result being, that the expensive expedient of "double-heading" was often necessary. The new class K locomotives have been designed to haul the heavy 13, 14 and 15-car trains and make time. These locomotives are the heaviest ever built for passenger service anywhere. The principal dimensions of the new class K, the class J, and the Chicago & Alton* 4-6-2 locomotives are given in the following table:

	Class K.	Class J.	Chicago & Alton.
Total weight, lbs.	233,000	174,500	219,000
Wt. on drivers, lbs.	168,000	130,000	142,000
Cylinders, in.	21 1/2 x 28	20 1/2 x 28	22 x 28
Diam. of drivers, in.	70	80	73
Heating surface:			
Fire-box, sq. ft.	227	174	230
Tubes, sq. ft.	3,678	3,169	3,848
Total, sq. ft.	3,905	3,343	4,078
Number of tubes.	322	285	330
Length tubes, ft. & in.	19-6	19-0	20-0
Diam. of tubes, in.	2 3/4	2 3/4	2 3/4
Grate area, sq. ft.	55	48.5	54.0

It will be seen that the class K locomotive is 58,500 lbs. heavier than the class J and that this additional weight, with the exception of 22,500 lbs., is on the drivers. The Chicago & Alton engine weighs less than the class K, but the boiler is larger. The class K has 562 sq. ft. more heating surface than the class J, the additional heating surface being due to the larger fire-box and the greater number of tubes and their greater length. The class K locomotive has 55,333 lbs. on each driving axle and the maximum tractive effort is 27,850 lbs. The ratio of weight on drivers to maximum tractive effort is 5.96, which is higher than that for any American passenger locomotive built in recent years. It is interesting to note that the class K locomotive weighs 14,000 lbs. more than the Chicago & Alton locomotive, notwithstanding the fact that the C. & A. engine has a four-wheel leading truck and a slightly larger boiler than the class K. The principal dimensions of the class K follow:

General Dimensions.

Gage.	4 ft. 8 1/2 in.
Fuel.	Bituminous coal
Weight on working order.	233,000 lbs.
Weight on drivers.	168,000
Wheel base, driving.	14 ft. 0 in.
Wheel base, total.	34 ft. 3 in.
Wheel base, total engine and tender.	62 ft. 4 1/2 in.
Tractive power.	27,850 lbs.

Cylinders.

Diameter of cylinders.	21 1/2 in.
Stroke of piston.	28
Diameter of piston rod.	4
Kind of piston packing.	Dunbar

Valves.

Kind.	Piston, 12 in. diameter
Greatest travel.	5 1/2 in.
Outside lap.	1 1/2
Inside clearance.	1 1/2
Lead in full gear.	1-16

Wheels, Etc.

Number of driving wheels.	6
Diam. of driving wheels, outside of tire.	79 in.
Material of driving wheel, centers.	72
Thickness of tire.	3 1/2
Diam. of trailing wheels, outside tire.	48
Diam. and length of driving journals.	9 1/2 x 12
Diam. and length of trailing journals.	5 x 14
Diam. and length of main crank-pin journals.	7 x 6 1/2
Diam. and length of side rod journals.	7 1/2 x 4 3/4
Diam. and length of front journals.	5 x 4
Diam. and length of back journals.	5 x 4 1/2
Engine truck, kind.	2-wheeled swing center
Engine truck; journals.	6 1/2 x 12
Diameter of engine truck wheels.	42 1/2

Boiler.

Style.	Extended wagon-top, radial stay
Outside diameter of first ring.	70 in.
Working pressure.	200 lbs.
Thickness of plates in barrel and outside of fire-box.	11-16 in. 3/4 in.
Fire-box length.	25-32 in., 9-16 in., 9-16 in.
Fire-box, width.	109 in.
Fire-box, depth.	74
Fire-box plates, thickness.	Front, 80 1/2 in.; back, 68 in.
Fire-box, water space.	4 1/2 in. sides, 4 in. back
Tubes, number.	322
Tubes, spacing.	3/4 in. front, 13-16 in. back
Tubes, diameter.	2 3/4 in.
Tubes, length over tube sheets.	19 ft. 6 in.
Fire brick, supported on.	(4) 3-in. tubes
Heating surface, tubes.	3,678 sq. in.
Heating surface, water tubes.	29 sq. ft.
Heating surface, fire-box.	198

*See *Railroad Gazette*, Nov. 7, 1902.

Heating surface, total.....3,905 sq. ft.
 Grate surface.....55 "
 Grate, style.....Rocking
 Ash pan, style.....Hopper
 Exhaust pipes.....Single
 Exhaust nozzles.....5½ and 5¼ in. diameter
 Smokestack, inside diameter.....18 and 21¼ in.
 Smokestack, top above rail.....14 ft. 10½ "
 Cab material.....Steel

Tender.

Style.....Water bottom, gravity slides
 Wheels, number.....8
 Wheels, diameter.....36 in.
 Journals, diam. and length, 5½ in. diam. x 10 in.
 Wheel base.....18 ft. 0 in.
 Tender frame.....13-in. channels
 Tender trucks.....Arch bar, cast-steel bolster
 Water capacity.....7,800 U. S. gallons
 Coal capacity.....15 tons

Concrete Abutment on the Ulster & Delaware.

BY M. H. MCGEE.*

The accompanying illustrations show a concrete abutment and long wing wall for a plate girder skew bridge on the Ulster & Delaware which was built last year. The bridge crosses a stream which frequently becomes a rushing torrent of water coming down from the mountains after a heavy rainfall and along with other structures over similar streams, was washed out a number of times before the present abutments were built. A long wing wall was therefore essential to prevent the banks washing out. The particularly interesting feature of this piece of work, however, is the construction of the parapet wall, and, incidentally, the date plate which was used. The abutments and wing walls are 12 ft. high above the foundation and are battered 1 to 12 on the face. On the upstream side the wing walls are 32 ft. 6 in. long, and on the downstream side 24 ft. 3 in. long. The superstructure is a through plate girder carrying a single track and crossing the stream at an angle of 67 deg. 30 min. The parapet wall is 2 ft. 1½ in. high and 12 in wide. at the top, and is reinforced with eight pieces of old rail about

*Assistant Engineer, Ulster & Delaware.



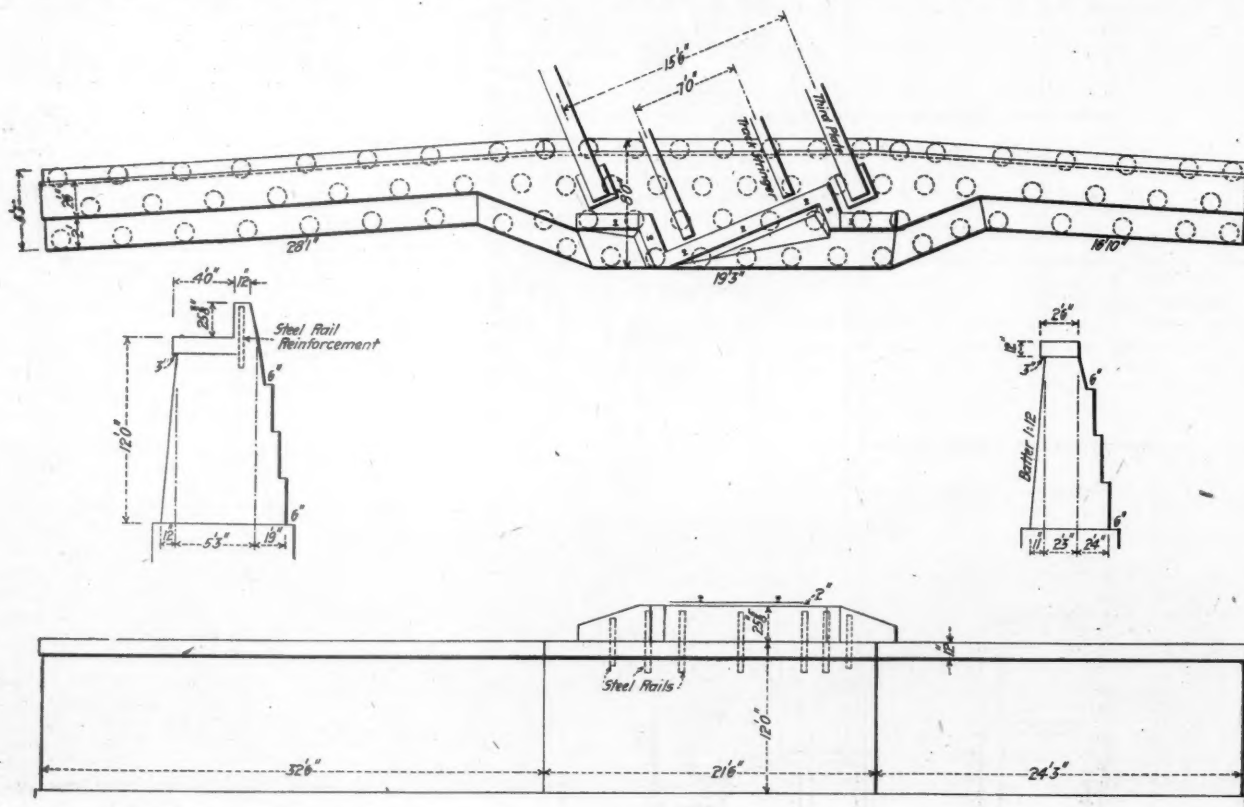
Finished Wing Wall Showing Date Plate.

4 ft. long, which are bedded half in the abutment and half in the parapet. This effectually prevents the parapet from becoming loosened from the bridge seat and protects it from the heaving action of frost in the fill behind which might crowd it forward.

The foundations rest on piles and a 1:4:7½ mixture of concrete was used in them. The proportions used for other parts of the structure were 1:3:6 for the body of the abutment, 1:2:4 for the bridge seat, 1:1:2 for the parapet wall, and 1:2 for the mortar facing. Portland cement and 1½-in. crushed limestone were used and the concrete was mixed in a cubical box mixer run by a small steam engine. The proportion of one barrel of cement, three of sand and six of stone made a batch of one cubic yard, and after a batch was thoroughly mixed it was

dumped from the mixing box into special skip shown in one of the illustrations. This skip held one cubic yard, or the entire contents of the mixer, and when filled was hoisted with a derrick, swung around over the forms and dumped all in one place. With the mechanical mixer it was possible to mix and lay more than three times as much concrete a day as had been laid on other similar jobs with the same force of men mixing by hand.

The use of a date plate adds greatly to the appearance of a piece of work of this kind. The one used on this bridge was 18 in. high, 36 in. long and ½ in. deep with beveled edges. The figures are 10 in. high and 1 in. deep. Both the panel and the figures were made of wood, well shellaced and fastened together with wood screws. The



Concrete Abutment and Wing Wall for Skew Bridge, Ulster & Delaware.



Completed Bridge Showing Top of Parapet Wall.

panel with the figures was fastened to the inside of the forms in a conspicuous place slightly below the coping, and the concrete deposited next to them when the work reached that height in the forms. After the concrete had set and the forms were removed it was found that the wooden figures had swelled by absorbing moisture from the surrounding concrete so that they could not be removed without damaging the surface of the concrete and it was necessary to chip out the wood with a carpenter's chisel. There was no serious objection to this except that the date plate was destroyed and could not be used again on another job. On another abutment built later, the figures were also made of wood, but they were beveled with considerable draft so that they could be removed more easily. This, how-

grain crop suffered from drouth in southwestern Russia, but in the southeast it was abundant, and this is just the part of Russia most distant from market.

Suburban Traffic.

The following extracts are taken from the report on suburban traffic prepared by A. W. Sullivan for discussion at the International Railway Congress, and printed in the Bulletin of the congress:

In response to the circular of inquiry, replies were received from 129 railroads, of which 97 stated that they had no suburban traffic, and 32 gave information which forms the basis of this report. Of these railroads, 23 are in the United States, one in Canada, two in the Argentine Republic and one in Brazil.

The districts served by the 32 railroads reporting service include 16 cities, having an aggregate population of 11,797,000. The principal cities enumerated, with their populations, are as follows:

Boston	600,000
New York	3,500,000
Jersey City	206,000
Newark	300,000
Philadelphia	1,300,000
Pittsburg	354,000
Cincinnati	330,000
Atlanta	100,000
St. Louis	600,000
Chicago	2,000,000
St. Paul	163,000
Minneapolis	203,000
San Francisco	350,000

Total in the United States.....10,066,000
Montreal 268,000

Total in Canada 268,000
Buenos Aires1,000,000
Rio Janeiro 523,000

Total in South America 1,523,000

Total of all countries11,797,000

The range of travel seldom exceeds 25 miles, and the average distance traveled is about seven miles. In nearly all cases an effective road competition is found to exist, principally in the form of electric street railways running more or less closely parallel with the steam railroad lines. The total number of suburban passengers transported per annum by each railroad within the districts covered by this report, is shown in the following statement:

Name of railroad.	District.	Passengers per year.
Atlanta & West Point	Atlanta	146,000
Baltimore & Ohio	New York	5,600,000
Balt. & O. Southwestern	Cincinnati	250,000
Boston & Albany	Boston	6,000,000
Boston & Maine	Boston	12,500,000
Central of Georgia	Atlanta	130,000

Central of New Jersey	Jersey City & Newark	3,150,000
Chic. & Burlington	Chicago	1,280,000
Chic. & East. Illinois	Chicago	2,300,000
Chic. & North Western	Chicago	8,300,000
Chic. Terminal Transfer	Chicago	800,000
Cin., Ham. & Dayton	Cincinnati	900,000
Cin., N. Orl. & Tex. Pac.	Cincinnati	233,000
Del., Lack. & Western	New York	11,300,000
Erie	New York	6,000,000
Georgia	Atlanta	186,000
Grand Trunk	Chicago	810,000
Illinois Central	Chicago	15,000,000
Long Island	New York	930,000
Minn. & St. Louis	St. Paul and Minneapolis	420,000
N. Y. Cen. & Hud. River	New York	7,000,000
N. Y., N. H. & Hartford	Boston	13,200,000
Pennsylvania Railroad	New York	2,350,000
Pennsylvania Railroad	Philadelphia	4,000,000
Pennsylvania Company	Pittsburg	3,240,000
Phila. & Reading	Philadelphia	11,000,000
St. Louis & S. Francisco	St. Louis	600,000
Southern Pacific	S. Francisco	18,177,000

Total in the United States135,802,000

Canada.

Grand TrunkMontreal.... 1,110,000

Total in Canada 1,110,000

South America.

Argentine Republic		
Buenos Aires, Rosario & Central Argentine	Buenos Aires	4,456,000
Ferrocarril del Sud	Buenos Aires	6,232,000
Brazil		
Central Brazil	Rio Janeiro	9,000,000

Total in South America 19,688,000

Total of all countries156,600,000

*Includes ferries.

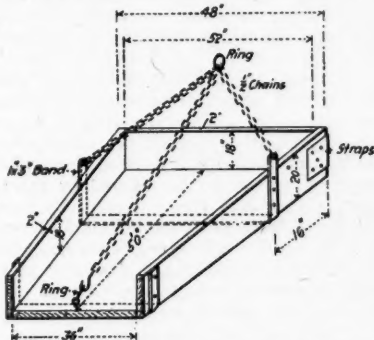
In the United States and Canada block signals are in general use upon the suburban lines of 25 of the railroads reporting; only four lines in the United States, with very light suburban traffic, reported that they handled it without the use of the block system. The use of block signals for suburban traffic is also well established in Argentina and Brazil.

Of the block systems in use in the United States and Canada, 15 are automatic, being operated either electrically or pneumatically; six are manual; three are combined automatic and manual; and one road uses an automatic system in combination with the electric staff. In Argentina and Brazil, the manual block system is used.

The total number of blocks within the suburban districts of all the railroads which reported is 2,337. The minimum length of blocks varies from 300 to 5,280 ft., the average being 1,833 ft. The maximum length of blocks varies from 1,500 to 29,400 ft., the average being 11,243 ft. The average length of all blocks on suburban lines is 5,267 ft. In the United States and Canada, the semaphore signal is used exclusively in the manual block systems. For the automatic block systems, six railroads use the semaphore signal exclusively, one uses the disc signal exclusively, while eight railroads use both the semaphore and disc signals. Upon the three railroads which use both the automatic and manual systems, the form of signal is the semaphore. In Argentina, the semaphore signal is exclusively used, and in Brazil narrow flags are used for block signals.

In the use of signal lights, it is found that for the "clear" indication in the United States and Canada, 19 railroads use white, and six use green. For the "caution" indication, 15 railroads use green, six use yellow, two use a combination of green and red, and two use no "caution" signal. For the "stop" signal all railroads use red. In Argentina, green is used for "clear," and red for "stop"; no "caution" signal being used. In Brazil, white is used for "clear," green for "caution" and red for "stop." All railroads make use of flag and lamp signals displayed by hand as auxiliary to the block signals, and to further insure the stoppage of trains when the block signal indications cannot be clearly seen, four railroads use derails, and four use torpedoes and fuses, in addition to the flag and lamp hand signals.

Upon nearly all railroads, the officials and employees engaged in suburban service also



Skip Bucket for Placing Concrete.

ever, proved no more successful than the first attempt, and the wood was again cut out with a chisel. The cast iron date plate described in the *Railroad Gazette*, August 19, in which the figures were beveled, is probably much more satisfactory than the wooden plates used here, but it would seem to be absolutely necessary to coat the iron plate with paraffin or some other waterproofing so as to prevent rust stains on the cement facing of the wall.

The scarcity of box cars in Russia is such that flat cars are used this fall for carrying grain in sacks. The draft of cars and locomotives for the long line to the seat of war has left most of the railroads short; and when rolling stock is returned to them from the Siberian Railroad it is likely to need extensive repairs, which cannot easily be made in the Manchurian or Siberian shops. The

perform other duties connected with the general passenger traffic, so that it has been found not practicable to determine definitely the total staff employed exclusively in the working of suburban service. This is particularly true as to the station forces, which perform duties for all classes of trains. As to the employees on suburban trains, it is found that for a minimum train service they consist of a crew of two men on the locomotive, the engineman and the fireman; and a crew of two men on the cars, the conductor and the flagman; making a minimum crew of four men to each train. When a train consists of more than four cars, it is customary to add another man to the train crew for each additional two cars, whose duties are chiefly to assist in the collection of tickets, and who is generally designated as a collector. The collectors as a rule occupy positions in the middle of the train, the conductor forward next to the locomotive, and the flagman at the rear to protect the train by hand signals in the event of an unusual stop being made. This disposition of the train crew is subject to variation on different roads, according to the local circumstances and conditions of the service. The work of the crews is regulated by three systems: that of the hours on duty, the number of trips made, or the number of miles run. As the distance traversed in suburban service is generally the lesser factor, the majority of roads regulate the work of the crews upon a time basis, the usual allotment per day being from 10 to 12 hours. When the work is regulated upon a mileage basis, 100 miles is usually assigned as a day's work. Upon a trip basis, the allotment is equivalent to 100 miles, or ten hours of service. The compensation is based upon a rate either per mile, per trip, per hour, per day, or per month, according to circumstances and agreement.

From the information furnished by the different railroads, the following tabulated statement of the seating capacity, length and weight of suburban cars now used, has been prepared:

Name of railroad.	No. of seats.	Length over ends of underframe		No. of wheels.	Weight.		Total weight.	
		in ft.	in in.		Body.	Trucks.	Per lin. ft.	Per seat.
Atlanta & West Point	60	52.5		8	42,920	16,080	57,600	1,097
Baltimore & Ohio	56	49		8	33,050	15,000	48,050	1,068
Baltimore & Ohio Southwestern	56	45		8	33,230	28,720	63,950	1,048
Boston & Albany	82	61		12	32,400	21,700	54,100	1,082
Boston & Maine	70	55		8	36,350	21,700	58,050	1,055
Central of Georgia	77	60		8	44,100	23,300	67,400	1,123
Central of New Jersey	56	50		8	50,000	1,000	51,000	893
Chicago, Burlington & Quincy	58	53		8	53,400	1,008	54,408	921
Chicago & Eastern Illinois	60	51		8	36,900	17,000	53,900	1,057
Chicago & North Western	68	51		8	29,400	18,800	48,200	945
Cincinnati, Hamilton & Dayton	72	56		8	33,100	12,500	45,600	884
Cincinnati, New Orleans & Texas Pacific	80	52		8	41,500	17,000	58,500	1,125
Delaware, Lackawanna & Western	64	51.5		8	36,000	17,400	53,400	1,057
Erie	58	48		8	31,640	15,660	47,300	985
Grand Trunk, Chicago	60	52.5		12	33,260	27,040	60,300	1,150
Grand Trunk, Montreal	64	57		8	46,000	22,000	68,000	1,193
Illinois Central, old cars	68	57.5		8	46,000	22,000	68,000	1,188
Illinois Central, new cars	70	57.5		8	46,300	22,000	68,300	1,188
Minneapolis & St. Louis	80	67		12	72,100	37,100	109,200	1,630
New York Central & Hudson River	60	51		8	60,400	1,184	61,584	1,007
New York, New Haven & Hartford	66	52		8	68,500	1,317	69,817	1,038
Pennsylvania Company	58	52		8	57,150	1,099	58,249	985
Philadelphia & Reading	62	51		8	56,950	1,117	58,067	919
Average	64.61	52.9		8	39,467	21,555	60,922	1,144

The average over-all speed of suburban trains between the starting and terminal points of a representative section of line in

the United States and Canada, is found to range as follows:

Speed, per hour.	No. of roads.	Speed, per hour.	No. of roads.
13 ".....	1	25 ".....	4
17 ".....	1	26 ".....	2
18 ".....	1	28 ".....	1
19 ".....	1	30 ".....	3
20 ".....	1	35 ".....	1
21 ".....	1	37 ".....	1
22 ".....	5	38 ".....	1
23 ".....	2		
24 ".....	2		

The average speed on the 28 railroads was 24.7 miles per hour. In Argentina, the average speed is 31 miles per hour, and in Brazil, 10 miles per hour. The length of the representative section of suburban lines for all the railroads (used in computing average speed) ranged from $5\frac{1}{2}$ to 44 miles, the average being 19.2 miles. The number of stations on the representative sections ranges from 5 to 32; the average being 19 stations. The longest distance between stations ranges from 0.83 of a mile to seven miles; the average being 3.24 miles. The shortest distance between stations ranges from 0.125 of a mile to 1.10 miles; the average being 0.44 of a mile. The average distance between stations ranges from 0.5 of a mile to 2.4 miles; the average being 1.12 miles. The average time trains are at rest at intermediate stations for discharging and receiving passengers is 30 seconds.

The greatest number of trains run in any one hour in one direction ranges from 1 to 50, the average being 9.5 trains. Ten railroads follow the practice of stopping all trains at all stations within the suburban district, while 20 railroads alternate non-stopping trains with stopping trains. Under the practice of stopping all trains at all stations, as many as 30 trains are run in one direction in one hour on a section 26 miles in length with 18 stops; while under the practice of alternating non-stopping trains with stopping trains, the movement of 14 trains in one direction in one hour, is the greatest number reported on a section 12 miles long, in which 14 stops are made by the trains which stop at all stations. There are no cases reported where precisely similar

tion, but it is manifest that the method of alternating stopping and non-stopping trains, greatly reduces the capacity of the line for train movement. The greatest number of trains run into the chief terminal station used by suburban trains in any one hour, ranges from 1 to 53; the average being 14 trains. The greatest number of trains run into and out of the chief terminal station used by suburban trains in any one hour, ranges from 1 to 78; the average being 21 trains. The number of trains—total of inwards and outwards—dealt with on an average week-day within the 24 hours, ranges from 4 to 829; the average being 195 trains.

The successful results in respect to punctuality of trains are variously attributed to the following reasons:

1. Suitable train schedules;
2. Efficient locomotives;
3. Good organization;
4. Rigid discipline;
5. Prompt departure of trains from initial station;
6. Short stops and quick work at intermediate stations in discharging and receiving passengers;
7. Distribution of passengers to seats throughout the train after train has resumed motion;
8. Prompt and efficient methods of collecting tickets and fares.

Seventeen railroads have no barriers at stations to prevent access to trains; seven roads have barriers which are closed at the time for departure of trains; two roads have barriers which are closed 30 seconds, and two roads one minute, before the departure of trains.

The cost of operation per suburban train mile is not readily ascertainable for the reason that few railroads keep separate account of the expense of suburban service; this expense ordinarily being included in the general expense account of passenger service. Some 13 railroads of the United States and Canada, however, have submitted estimates of the expense of suburban operation, which ranges from 30 cents per train mile upon lines of light traffic and simple methods of operation, to \$1.00 per train mile upon the heavy lines; the average cost for all of the roads giving this information being 61 cents per train mile. On the question as to what is a remunerative earning per train mile in a suburban district, the opinion prevails that inasmuch as the service offered by the suburban trains of a railroad is to be considered more from the point of view of public necessity and convenience, than from considerations of net revenue, that any rate of earnings which exceeds the cost of operation, is to be considered remunerative.

Notes on the Early History of the Hudson River Tunnel.*

BY S. D. V. BURR.

As planned originally the grade of the tunnel for the first 1,600 ft. from the western shore was 2 per cent, which then continued as 1 per cent. to 1,300 ft. from the eastern or New York shore. From this point the grades were 4 per cent. and 3 per cent. to the terminus. The contour of the bed of the river governed this grade and as the channel was only about 60 ft. deep and about 1,000 ft. from the New York bulkhead, the steepest grade was at the eastern section. This, of course, also permitted the easy grade for four-fifths of the distance from the Jersey side.

But those who now enter the tunnel at the western end will look in vain for this

*Previous articles on this subject by the same author were printed in the *Railroad Gazette*, June 3 and October 14 of this year.

easy grade for the first three or four hundred feet from the shaft. That portion of the tunnel takes a wonderfully erratic course and dips, rises and level stretches follow each other indiscriminately. The crown appears to have assumed its own grade—which it undoubtedly did—irrespective of the plans of the engineers, as will be explained later. At one short section the grade is over 10

not protected in any way and was cut into steps or terraces upon which the men stood while shoveling out the silt. As fast as the silt was dug out to the circumference of the tunnel a plate was inserted and bolted to the ring already in place. As soon as three or four rings had been completed the brick work—at first 24 in. thick and afterward 30 in. thick—was started at the invert, carried up the sides and over the arch. A finished portion of the tunnel, four rings of plates and the advance plates are shown in both Figs. 2 and 3. The plates were of boiler iron $\frac{1}{4}$ in. thick, $2\frac{1}{2}$ ft. wide and 3 ft. and 6 ft. long. The flanges were 3 in. wide and the bolt holes 6 in. apart.

or expectation that it would settle to the proper position. This proceeding was of no avail, mainly for the reason that the exact nature of the material in advance of the heading was not known. If it turned out to be stiff and tenacious the settlement would be slight, possibly not enough to bring the crown to grade, and if a little sand were encountered the crown might come down so rapidly as to carry it below grade. It will thus be understood why that portion of the tunnel first built is noted principally for the eccentricity of its course.

The engineers were in a quandary, and fully appreciated the fact that their methods must be changed, and changed radically, if

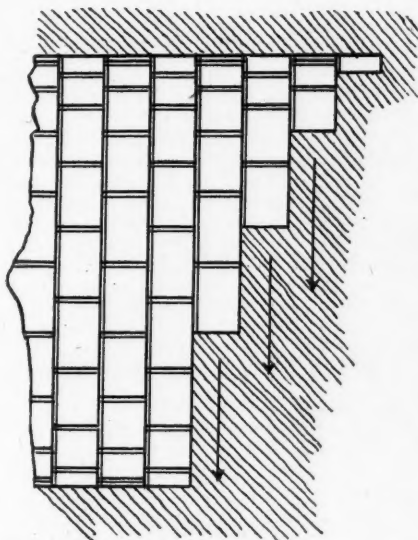


Fig. 1—Section Through Heading Showing Terraces.

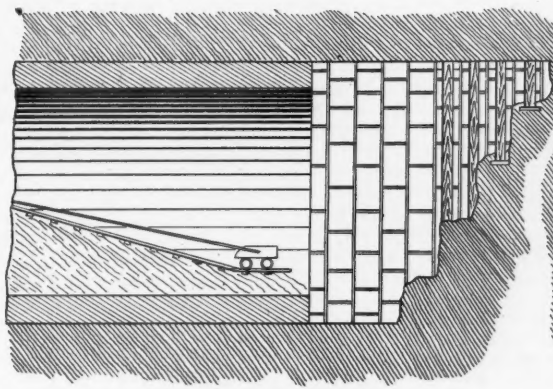


Fig. 2—Sections Through Unprotected Heading Showing Crown Sheet Supports Stepped on the Terraces.

per cent. The changes are abrupt and the tunnel is so irregular as to convey the idea that it was built of odd pieces, put together at odd times by builders who worked, each according to his own ideas of what was proper, irrespective of the conditions upon either side of them. The old engineers knew this grade would be excessive for steam traffic and therefore had in mind the rebuilding of this section, or, as a substitute, the filling in of the hollows, which the size of the tunnel would have allowed.

With the methods then followed it was

Necessarily the crown was pushed ahead of the finished ring and the shell had, therefore, the appearance, in longitudinal section, of a buggy top or inverted sugar scoop. This overhang of the crown was responsible for all the trouble. As soon as a crown plate had been inserted it was propped as firmly as possible, but as the foundation upon which the strut rested was nothing but silt which had been more or less disturbed by the men in digging, the support was inadequate. The weight or pressure of the silt upon the crown was constant and was continually increas-

they were to finish the undertaking. Since the difficulty seemed to increase as the depth below the river surface became greater, it was necessary to alter the plans as soon as possible.

At this stage of the work the superintendent, John F. Anderson, came forward with his scheme of tunneling through soft material with a "pilot." His plan provided a rigid center from which the plates could be braced as soon as they were put in position and which had ample strength to resist the movement of the silt. The plan was exceed-

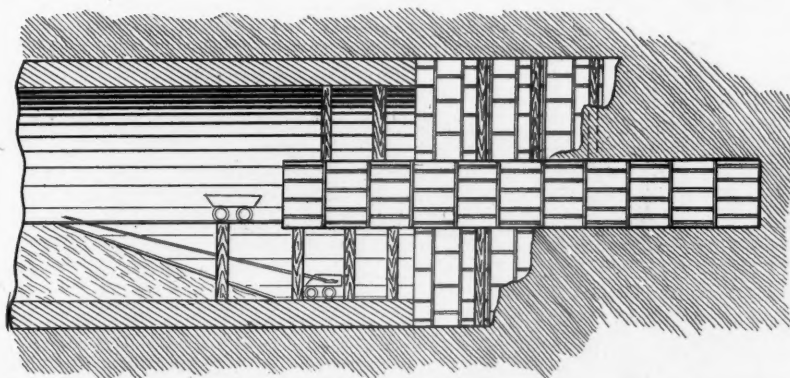


Fig. 3—Unprotected Heading, with Pilot Tube to Support Braces.

absolutely impossible to keep the tunnel anywhere near a uniform grade. The tunnel determined its own lines as it was pushed along and it was not within the power of the engineers to even influence this to any appreciable degree. The explanation was simple, but for a long time the remedy was not forthcoming, although it was known that unless the evil could be overcome the work would have to be abandoned, especially as the trouble became greater as the heading was advanced.

An examination of Figs. 1 and 2 will show the cause of the difficulty. The heading was

ing in amount. Of course this upper layer of silt had not been disturbed, but it is one of the properties of silt that, given the opportunity, it will move. When the bore of the tunnel had been removed, the overlying mass of silt settled. This settlement was slow, steady and sure and with no sufficient appliances at hand for resisting it, was irresistible. The work was performed as rapidly as possible in the endeavor to complete the rings and build the masonry before the depression occurred. Also, the attempt was made to obviate the difficulty by making the crown higher than it should be in the hope

ingly simple and comparatively inexpensive. It contemplated the employment of a strong axis, or beam, which should extend into the silt in advance of the face of the heading and be long enough to enter the completed masonry a short distance. Its front and rear ends being thus firmly held, the central portion would serve as a solid base from which the plates could be supported as long as need be.

As actually constructed this beam was an iron tube 6 ft. in diameter made up of plates 4 ft. deep, 22 in. wide and $\frac{1}{4}$ in. thick. Each edge of the plate was reinforced with angle

iron, and between the longitudinal and transverse joints were placed thick iron strengthening plates which projected beyond the outer surface of the tube. These plates were interchangeable and those at the rear were removed and carried forward as the work advanced. The tube was some 50 or 60 ft. long, about 25 or 30 ft. of which was in the solid silt in advance of the heading, hence the name "pilot."

By referring to Fig. 3 it will be seen that both ends of the pilot were held against any possible movement, the middle portion being free to receive the plate braces. The pilot was carried forward in precisely the same way as the main heading. Unusual settling of the plates of the pilot (as they were inserted) made no difference with its work, since its advance end was bound to be held firmly as soon as the silt had come to rest around it, and the particular grade it assumed was of no importance since it had no bearing upon the principal undertaking.

No rule was followed in locating the braces; they were merely inserted where needed and where most convenient. A track extended along the top of the pilot for the removal of material from the heading and the bringing forward of new plates. Another track was placed inside the pilot and served the same purpose.

After the introduction of the pilot there was no difficulty in keeping to grade; in fact, the direction of the tunnel, vertically or horizontally, could be changed at will. Over 3,000 ft. of tunnel were built with it and it was not discarded until the English engineers assumed control and introduced the shield.

Tie Timber and Spikes in Argentine Republic.

In a recent communication to the Department of Agriculture, Bureau of Forestry, Mr. Guillermo Dominico, Inspector General of the Ferro-carriles y Transportes, Argentine Republic, gives some interesting facts about tie timber in that country and also about screw spikes and dowels. The only wood used for ties is the "Quebracho Colorado," or iron wood, which is of the Anacardiaceae family. It is much heavier than water, having a specific gravity of 1.350 to 1.400, and is as hard as its name would indicate. This timber has 30 per cent. more elasticity than oak or pine, three times as much resistance to compression, 20 per cent. more strength in tension, and twice as much resistance to flexure as oak. It will apparently last forever since not a single case has been ever observed where sound quebracho, without sap, has rotted, but on the contrary it seems to get harder with time and exposure. One of the exhibits of the Argentine Republic at the World's Fair, St. Louis, consists of a railroad tie cut in two pieces and other cross-sections of ties which have been in track under constant use for 25 years. They would have been perfectly good for another 25 years or even longer if they had not been removed for exhibition. The original spikes driven 25 years ago have been left in the wood. Pieces of this and other native hard woods which have been removed from piers and docks after immersion in salt water for 50 years show no rotting in the portions exposed to the alternate wetting and drying caused by the tides.

Three sizes of ties are used, one 9 ft. x 5 in. x 9 $\frac{1}{4}$ in. for broad gage (5 ft. 6 in.) track, one 8 ft. 4 in. x 5 in. x 9 $\frac{1}{4}$ in. for middle gage (4 ft. 8 in.) track, and one 6 ft. x 5 in. x 9 $\frac{1}{4}$ in. for narrow gage (3 ft. 6 in.) track. These weigh 220, 198 and 165 lbs. respectively, and when spaced 12 to 15 ties under each rail length of 33 ft. 4 in., give a

very solid track. In case of derailment these ties are seldom damaged by cutting of the wheel flanges even on bridges. Ties are cut from small trees 10 in. to 12 in. in diameter, or sawed from large trees 2 ft. to 3 ft. in diameter and 50 ft. high. Those most preferred are cut from logs which will give two ties for each length of log. These logs are hewn or sawed to about a 10-in. square section and split down the center, and ties cut in this manner are usually the soundest and best timber procurable. The large quebracho trees and those having curved or bent trunks are cut up into sections weighing from two to three tons, and are shipped to Europe for tanning purposes, this wood being very rich in tannin.

In the timber regions, the price of ties delivered alongside the track is from \$1.10 to \$1.20, American gold, for the broad gage ties, 88 cents for middle gage ties, and from 50 cents to 60 cents for narrow gage ties. The cost aboard ship in the upper Parana river ports is about \$1.50, \$1.20 and 80 cents respectively, and delivered in Europe the estimated cost is \$2, \$1.70 and \$1.20 each, American gold. These ties form an ideal cargo because of the regularity of dimensions and the relatively small proportion of weight to volume. The most important advantage of quebracho timber, however, is the fact that after having been in track for 30 to 40 years they are still worth 50 per cent. of their original value because of the tannin contained in them.

The quebracho colorado grows in vast and almost virgin forests covering the plains reaching from Santa Fe and Santiago del Estero to the north frontiers of Bolivia and Paraguay. The climate on these plains is temperate, from 40 deg. to 105 deg. Fahr. Within the last few years a number of railroads have been built into this territory for the purpose of hauling out the timber. The native Indians who are dexterous with an axe do most of the cutting and are paid from 25 cents to 40 cents per tie for hewn ties. The squared logs are usually brought to saw mills and cut in two with circular saws. Forest lands on these plains can be bought from the Government for about \$325, American gold, per square mile.

No tie plates are used under rails laid on these ties in the Argentine Republic since

they are entirely unnecessary owing to the hardness of the wood. After 25 years service these ties show a perfect rail seat. Spikes cannot be driven into the wood without first boring a hole slightly smaller than the spike, but having once been driven they are practically immovable and cannot be pulled out without strong pressure. Screw spikes have, however, almost entirely replaced smooth spikes, but not because the latter will not hold down the rail. In case of derailment and consequent damage to track, the smooth spikes are bent and the heads are sometimes broken off, requiring new holes to be bored in the tie. In course of time the tie becomes full of holes near the rail seat and must be taken out long before its natural life is destroyed. With screw spikes this is avoided since the spike can be screwed out of the tie and a new one put in the same hole provided moisture has not entered and rusted the spike fast. The screw spikes used have shallow threads of small pitch, closely resembling metal screw threads. Dowels are not used because there has as yet been no scarcity of timber and therefore no necessity for employing expensive means for prolonging the life of ties.

Railroad Shop Tools.

(Continued.)

SPECIAL DRILLING MACHINES.

Fig. 1 shows a four-spindle brake lever drill, made by the Newton Machine Tool Company, Philadelphia, Pa. This machine is used for drilling at one operation the four holes in the brake levers of freight cars. The distance between the uprights is 4 ft. 6 in. The minimum distance between the centers of the two heads on the left-hand side of the rail is 4 $\frac{1}{2}$ in., the minimum distance between the centers of the two center heads is 6 $\frac{1}{2}$ in., and the minimum distance between the two heads on the right-hand side of the rail is 10 $\frac{1}{4}$ in. All the heads are adjustable along the rail and the distance between the spindles can be adjusted so as to be used for all sizes or designs of brake levers within the capacity of the machine. The spindles are driven through gearing by a two-step cone and have no vertical adjustment. The

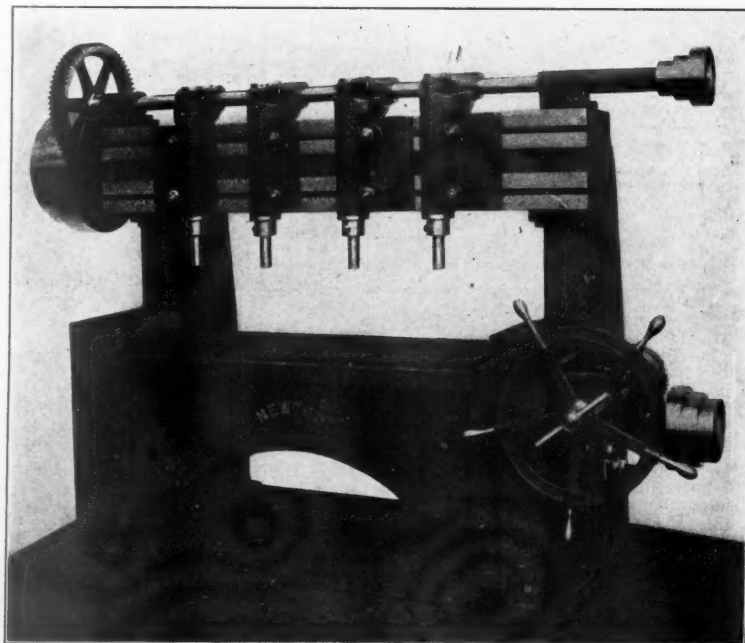


Fig. 1—The Newton Four-Spindle Brake Lever Drill.

feed is obtained by moving the work table, which has a vertical adjustment of 9 in. with three changes of automatic feed and quick hand movement. The maximum distance from the end of the spindles to the work table is 20 in. Each spindle is fitted with a sliding socket so that the different lengths of drills can be adjusted to the proper height from the table.

The drill shown in Fig. 2 is made by Foote,

has a capacity for drilling holes up to and including 2 in. diameter in steel. The spindles are adjustable along the rail and the minimum distance between centers of the spindles is 8 in. The maximum distance between the faces of the uprights and the center spindles is 12½ in. and the distance in the clear between the uprights is 49½ in.

The spindles have a power feed of 12 in. and an automatic knock off. The table has

a vertical adjustment on uprights of 14 in. and is 24 in. wide by 121 in. long. The maximum distance from the nose of the spindle to the top of the table is 26 in. Arch bar fixtures are supplied with the drill and are used as shown in the illustration. It is claimed that this drill, equipped as shown, can give an output of drilled arch bars nearly equal to any standard arch bar drill on the market, and at the same time the user has a tool that is suitable for almost any other class of drilling. The machine is geared 10 to 1 and has three changes of power feed. The spindles are forged open-hearth steel castings bushed with phosphor bronze. The spindle driving gears are 10 in. in diameter by 2½ in. face. This machine is known as the No. 5 independent feed drill and is made by Foote, Burt & Company, Cleveland, Ohio. The weight of the machine is about 12,000 lbs.

(To be continued.)

European Regulations Governing Railroad Employees' Hours.*

Legal or at least official regulations control the conditions of work of certain classes of railroad employees in Germany, Austria, France, Italy, Holland and Russia. The same applies to India and Australia, whereas in England the law, without specifying anything definite as to the duration of work and of rest of railroad employees, is limited to giving the authorities the right to control the conditions of work of the men whose work affects the safety and gives the Board of Trade the power to reduce the hours if it considers them excessive.

In Hungary, Belgium, Denmark, Spain, Luxemburg, Roumania and Serbia, there are no law bearing on the duration of work and of rest of railroad employees. Nevertheless the regulations applied by the chief railroads of these countries themselves and by the English companies, do not differ very appreciably from those laid down in countries where the State is the chief owner of railroads, i.e., in Germany, Russia and Austria. The regula-

*Abstract of a report prepared for the next session of the International Railway Congress by Mr. Philippe, General Inspector of the North Belgium Railroads, Liege. The report deals with all countries except America and Switzerland. It is published in the I. R. C. Bulletin for September.

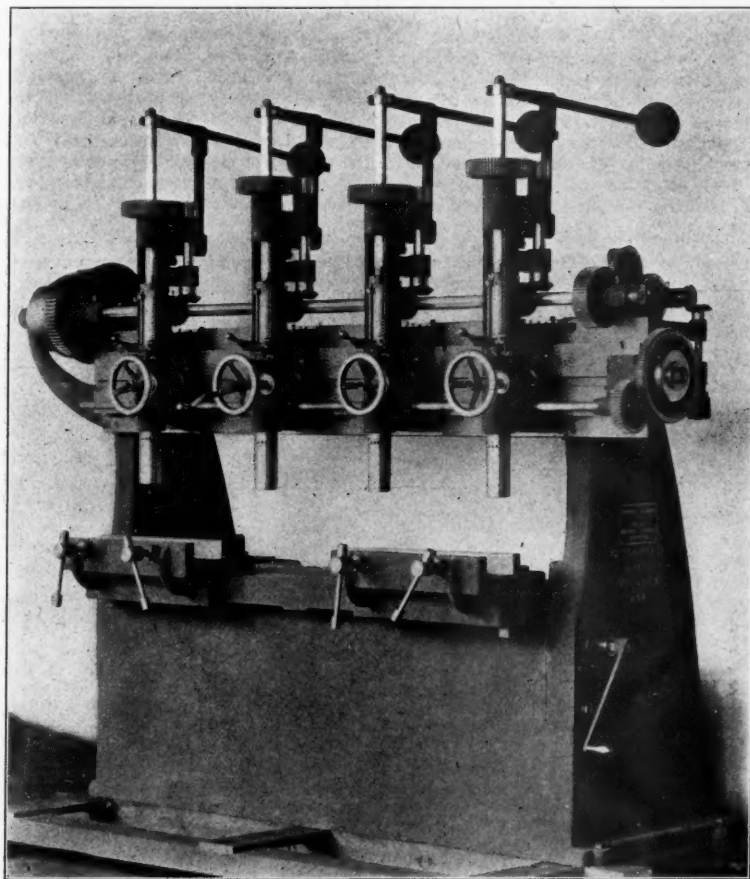


Fig. 2—Foote, Burt & Company's Mud-Ring and Flue-Sheet Drill.

Burt & Company, Cleveland, Ohio. It is known as the No. 1 mud ring and flue sheet drill. It was especially designed for the above purpose, but it is also adapted for a wide range of general work, such as steam chest covers, I-beams for trucks, brake levers, dome caps, and, in fact, any work which can be done on a multiple spindle machine. This tool can drill four holes 1¾ in. in diameter in steel, and will take work up to 10 in. thick. The maximum distance between the nose of the spindle and the top of the table is 16 in. and each spindle has 12 in. of vertical power feed. The distance between the housings is 6 ft. 7 in. and the minimum distance between spindle centers is 6 in. The distance between the outside spindle centers is 72 in. The machine has three spindle speeds and three power feeds. An automatic "knock-off" is supplied to the feed and the heads are adjustable along the rail while the machine is in motion. The table has an in-and-out adjustment of 18 in. This adjustment is operated by a crank wrench from either end of the machine. The spindles are of forged open-hearth steel and the spindle sleeves are of cast-steel bushed in the spindle fit with phosphor bronze. All of the miter gears are cut from drop forgings. The machine weighs about 11,000 lbs.

The independent feed drill shown in Fig. 3

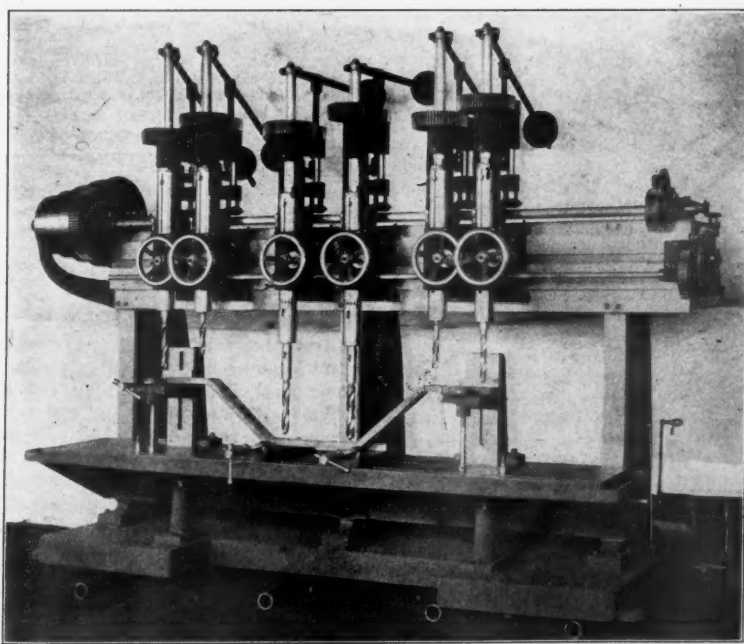


Fig. 3—The Foote, Burt & Company's No. 5 Independent Feed Drill.

tions all show the very marked desire to proportion the work to the resulting fatigue, so as to avoid any possibility of men becoming overworked. As a general rule, the legal enactments as well as the private regulations only deal with the conditions of work and of rest of the employees whose work affects the safety of the traffic.

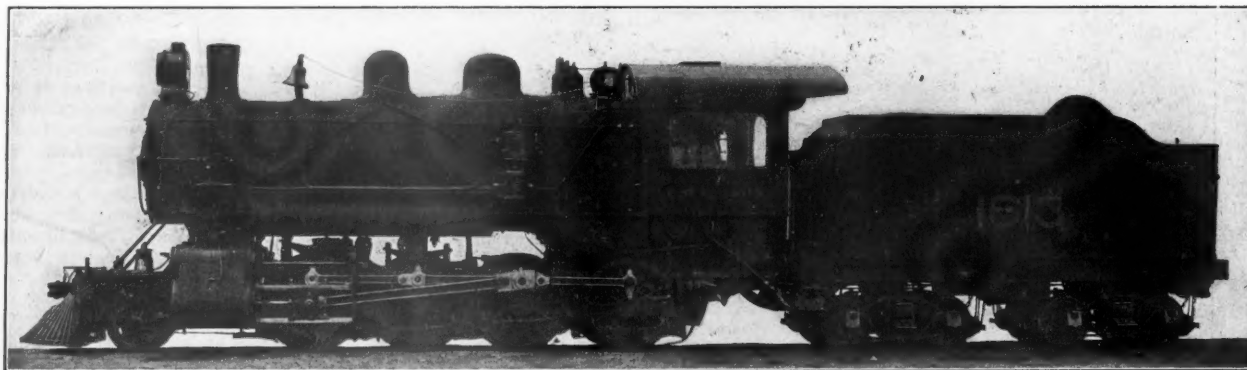
Most of the regulations examined divide employees into two classes: (1), station and roadway employees; (2), locomotive and train staff. For the first class the requirements are, of course, simple. In the second class the work from day to day varies in amount, so that in the regulations the unit is usually a longer period. In Germany and in Austria work days and rest days are calculated on a basis of 30-day terms; in France on 10 days; in England on seven; in Holland on 14, and in Russia on six. Requiring shorter periods of work from enginemen and

public opinion; hence the more or less strict laws and regulations which we have considered."

Canadian Pacific Superheated Steam Locomotive.

The Canadian Locomotive Company, Lim., Kingston, Ont., has just completed an order for 10 simple consolidation (2-8-0) locomotives for the Canadian Pacific. These engines were designed by Mr. H. H. Vaughn, Superintendent of Motive Power, and are chiefly interesting because they are fitted with Schmidt superheaters. The Canadian Pacific was the first in this country to experiment with superheaters and last year ordered them applied to a number of ten-wheel passenger locomotives built in Germany. Their application to this last order would seem to indicate that the results from those

of beginning the sessions, the closing of the day, and the like, but rules often bind the hand of the management much more tightly than they hold the machine together. Specific punishment should never be prescribed for certain offenses. What can or cannot be done consistently with conditions is quite as well known by the organization as the management and does not need to be discussed. Circumstances alter cases and in some situations privileges might be granted that in other situations would be impossible. At all times, all the liberty consistent with the best results should be permitted. There should be no persistent rules, no strait-jackets. Everyone should feel the least restraint possible and with the liberty and freedom should be maintained a wholesome regard for the law and order essential for the best progress. Do right. Do nothing that will encroach upon the rights of another. Do as you know



Consolidation (2-8-0) Locomotive with Schmidt Superheater, Canadian Pacific.

firemen than from other trainmen is very general. In Germany employees have two off days per month, except those on secondary lines or posts, who have only one day off. The same is the case in Austria. In France, drivers and firemen have one off day out of ten, the train staff one day out of 15, and station employees one day per month. In Italy, the drivers and firemen have one off day per month, and the train staff three days per two months. In Holland, all the men have one off day out of 15. A similar practice is adopted on the Belgian and Danish railroads. The practice as to annual leave varies too much in the different countries to enable us to make a summary of it.

Mr. Philippe has found it impossible to make useful comparisons, between different countries, of the hours per day allotted for work and for rest, the customs of the inhabitants, conditions of climate, and other factors making it impossible to draw conclusions of value. In Germany employees whose work requires unbroken and sustained effort, must average not more than eight hours a day, with a maximum of 10 hours. Employees at large stations where the work is hard must be favored, while at small stations, with long periods of rest, 14 hours a day, and even 16 hours, may be allowed.

Referring to England, where there is no legal restriction except the power of the Board of Trade to interfere where work is found excessive, Mr. Philippe concludes that the regulations made voluntarily by the railroad companies are reasonable. In this connection he says that "the fable of overworked railroad servants is too readily believed in by the public of certain countries, where it is revived after every railroad accident, no matter of what nature and what may be its cause. Some governments have been affected in this way and have desired to reassure

now in use have been satisfactory. The following table gives the principal dimensions of the engines.

Type	Consolidation, 2-8-0
Fuel	Bituminous coal
Weight, in working order, total, lbs.	186,200
Weight in working order, on drivers, lbs.	163,675
Total wheel base, ft. and in.	24-4 1/2
Rigid wheel base, ft. and in.	15-10
Length of fire-box, in.	96
Width of fire-box, in.	65 1/4
Diameter of drivers, in.	57
Type of valves	Piston
Cylinders, stroke, in.	28
Cylinders, diameter, in.	21
Type of boiler	Wide fire-box, radial stays
Working steam pressure, lbs.	200
Tubes	22-5 in., 244-2 in.
Length of tubes, ft. and in.	14-2 1/2
Weight of tender, loaded, lbs.	130,000
Capacity of tank, Imp. gal.	5,000
Coal capacity	12 tons

Office Organization.

At the meeting of the Central Railway Club in Buffalo, November 11, there was a paper on office organization by Mr. W. R. Heath. Following are extracts:

Discipline.—There will come a time when some positive shock will be suffered in the organization—something which for the time almost paralyzes the institution. This should be dealt with strenuously. If the organization has been shocked out of adjustment perhaps a similar shock will place it in adjustment. Discipline should be so administered that it will not often be necessary. There should not be a continual bickering. All small difficulties should be passed without notice—large difficulties should be noticed vigorously, promptly and fearlessly. Never make rules. There are certain general rules which are always accepted and understood—such as the hours of employment, the time

you ought to do. These are quite enough rules of conduct.

Thought.—The office thought must be one thought and yet all must think. Thought is power and there must be the maximum of power and the minimum of machinery. I care not how great a thinker the manager may be he will fail if he does not inspire thought in every one. A man may have ten times the power of thought that his clerk has and yet he then has thought force equivalent only to ten clerks, and if he has one hundred clerks under his control he is then capable of but one-tenth of the thought which the office possesses, and if the office thought is retarded the power back of the machine is retarded. Encourage every man to think.

Moral Element.—President Roosevelt's statesmanship is of the moral type. Your worth and mine in the last analysis is a moral worth. Every man and every thing has an essential integrity. We hate a counterfeiter, a hypocrite, a cheat and an impostor. We are all looking for the good, the true and the honest in all we do and touch. You put a ring on your finger because of its precious metal or its precious memory. I care not how depraved a man may be himself, he speaks with pride of the man who is square! A straight line, a square, the lever and the plumb-line differ in their nature, yet one cannot imagine a disagreement between them—like true friends they each guarantee the other. When the whole world is wrong these are right. They are never sworn to tell the truth, their integrity and morality are known to every man and feared by every liar. Nothing can be more important in the office organization than this moral element. It is not so much smart men that we need as true men. The heart feeds and fires the brain.

GENERAL NEWS SECTION

THE SCRAP HEAP.

According to the newspapers, about 70 grade crossings in Chicago have been equipped with gates during the past two months, this action being in compliance with a recent city ordinance.

Between Dayton, Ohio, and Richmond, Ind., 42 miles, electric cars are now run, over the Dayton & Western, twice each way daily on an express schedule calling for only two stops; and the time is 1 hr. 20 min. These trains (or cars) go by the name of the Interstate Limited, and each car has a buffet from which luncheons are served and an observation room at the rear end. The cars are said to be of the "parlor type."

The flagman and the station master who were involved in the rear collision at Midvale, N. J., July 10, when 16 passengers were killed, have been tried at Paterson, N. J., for manslaughter and have been acquitted. It is said that in the case of Flagman Heller of the leading train, the jury voted nine for conviction to three for acquittal, and in the case of Station Agent Richards, acting as block signalman, the vote was seven to five for conviction.

A press despatch from Chicago says that the roads west of that city have agreed to discontinue their divisions of the through rates with the so-called industrial roads, this in deference to the recent finding of the Interstate Commerce Commission that the divisions amount to the payment of rebates to the shippers. The railroads have agreed that they will offer the industrial roads a maximum of \$3.50 per car.

The number of men now at work in the Schenectady Locomotive Works is about 3,000, most of these having been taken on during the past two or three weeks. The newspaper report to the effect that the almost entire cessation of work at these shops during a part of October and November is to be followed by the employment of 5,000 men, appears to be based partly on hope; on the expectation that new orders will come in fast enough to warrant the employment of more men than are now at work. It is said that the suspension of work for a month was made the occasion by the company of the revision of its contracts with most of its employees.

The Interstate Commerce Commission is to investigate the proposed uniform bill of lading, numerous petitions having been filed by the Illinois Manufacturers' Association and other trade organizations complaining of onerous conditions which carriers in official classification territory propose to put in effect January 1. A hearing will be held in Chicago December 5. The complaint is that the new regulations will make bills of lading not negotiable, will require shippers by signature to assent to conditions not heretofore enforced, and thereby recognize such conditions to be reasonable and just,

will compel shippers to bind themselves to conditions which largely exempt the carrier from its common law liability, will diminish the value of the service to the shipper while maintaining the accustomed charge, and will make the shipper pay 20 per cent. of the rate in addition if he insists upon the carriers' common law liability, thereby giving the old service at an increased charge.

The number of passengers carried on the New York subway during the first 29 days of operation was 5,838,235, equal to a daily average of 201,317. This includes only the line from the City Hall to Broadway and 145th street, the Lenox avenue line having been opened only two days before the close of this 29-day period. Trains on the Lenox avenue line will run to and start from 145th street for two or three months yet, the tunnel beneath the Harlem river, by which this line will be connected with the Borough of the Bronx, being unfinished. That part of the line in the Bronx above 149th street has been put in use already, connection being made with the Third avenue elevated line. This connection is at 149th street, and trains are run through to and from the lower part of the city over the elevated. The "subway" itself is in fact an elevated railroad throughout that portion of its line north of 149th street.

The Pennsylvania Railroad has countermanded all of the orders which have been in force during the past five months by which clerks and shop men have had to take vacations without pay in order to keep down expenses. All of these forces are now working full time. A large number of locomotives will be built at the Altoona shops, and it is expected that about January 1 an order will be given for building some engines at outside shops. Specifications are now being prepared for the tunnel under Manhattan, New York City, and it is expected that bids will be asked for within a month.

The United States Circuit Court, at San Francisco, has handed down a decision in the case of the Interstate Commerce Commission against the Southern Pacific and the Union Pacific in favor of the railroads. The point at issue was the right of the commission to declare unjust a rate on sugar from San Francisco to Kearney, Neb., as compared with the lower through rate to Omaha. The court found that the rate established by the defendant companies was not unjust; that the commission has no right to legislate and that the Union Pacific Railroad Company could not be bound by order of the commission, as it was not a party to the original suit (which was against the Receiver, who was then in charge).

Architecture Up to Date.

Two New York men were discussing a new club house which had recently been built at great cost. One of the men had just been inspecting the new building. "What style did you say it was decorated in?" asked the other. The man who had seen the interior reflected a moment. "I think it was either

late Pullman or early North German Lloyd," he replied.—*Harper's Weekly*.

Michigan Taxes and the School Fund.

The following is from the annual report of the Detroit & Mackinac: Taxes were paid under the old law as usual and accepted by the State under protest. Should the present law be declared constitutional it means taxing our freight shippers very severely. The law fixes our passenger rates and we cannot charge over 3 cents per mile, no matter what the taxes may be. Dividing our taxes by our freight earnings gives over 11 per cent. as the contribution of our shippers to the State school fund. Rather a severe handicap for people desiring to do business in Michigan.

Youthful Electricians.

A despatch from Boston says that two 15-year-old boys of that city have established a wireless telegraphic connection between their homes, half a mile apart. This recalls the fact that 30 days after the appearance of the first published accounts of Bell's invention of the telephone, two New York boys had built and were successfully operating an experimental telephone system of their own. These two boys have since achieved distinction in the electrical field, and have for many years been allied in business. They are Prof. Frank B. Crocker, of Columbia University, and Doctor Schuyler Skaats Wheeler.

Locomotive Tests at St. Louis.

The locomotive testing plant established and operated by the Pennsylvania Railroad System in the Transportation Building at the World's Fair made a remarkable record on Thanksgiving Day. Three tests were conducted which were the most satisfactory of any which have yet been made. The locomotive under test was the Cole four-cylinder balanced compound. The first test was run continuously for two hours at a speed of 57 miles per hour. The second test continued for an hour and a half at a speed of 66 miles per hour. The third test was for a full hour at the remarkable speed of 75 miles.

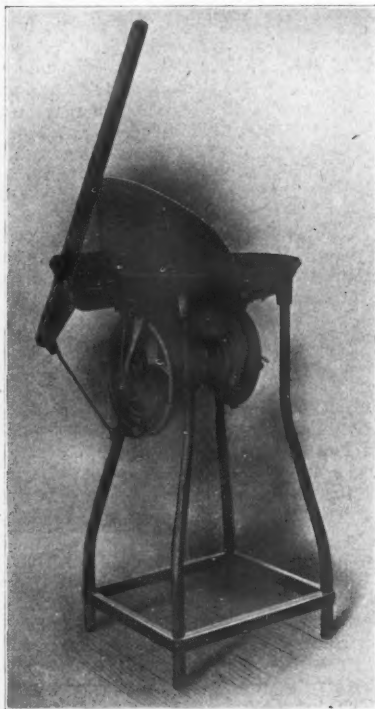
Locomotive and Trolley Both Ignored.

The massive granite block which is to form the lintel over the portico of the new Custom House has been brought to this city and now lies on pier No. 3, East River, having been hoisted from the schooner William Booth by the big steam derrick Century. The stone was quarried at Hurricane Island, Me., and is an exceptionally fine piece of Rockland granite. It is 30 ft. long, 4 ft. square, and weighs over 50 tons. The block, valued at \$10,000, represents a year's work in quarrying and dressing, and was considered so valuable that the schooner was towed to this port instead of proceeding under her own sail. Five weeks were consumed in getting the block from the quarry to the schooner, it being warped along over a rough country road on rollers by block and tackle. A special landing will have to be built at the head of the pier to get the stone on the

truck which will take it to the Custom House, pulled by a team of 20 or more horses. —*New York Tribune.*

Sturtevant Portable Forges.

The B. F. Sturtevant Company, Hyde Park, Mass., now makes its portable forges in 31 sizes, comprising seven distinct types, A, B, C, D, E, F and G; and has improved the designs. The sheet metal work of these forges is of heavy steel plate, and the running gear is strong and easy of operation. The tuyeres are made extra strong and the fire-pan is double with asbestos between the plates to prevent cracking of the main pan.



Sturtevant Portable Forge, No. A-1.

The blower is of the well-known Sturtevant pressure type, has babbitted journal boxes and has been redesigned to give increased capacity. Types A, B and C are alike except in the means of producing the blast. In type A there is an attached blower driven by hand power; type B forges are arranged for pipe connection and receive blast from an independent blower. Forges of the C type are fitted with a blower driven by a pulley on the forge.

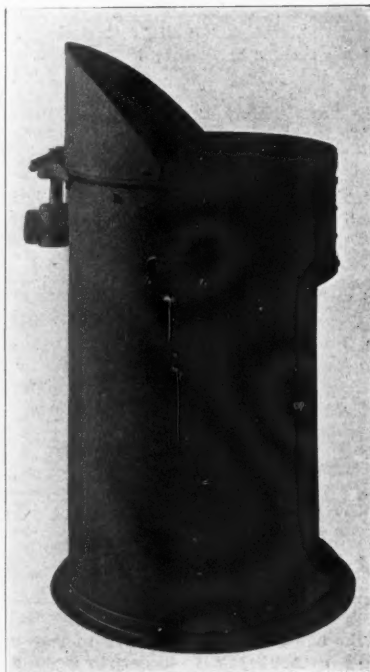
Type A is built in five sizes and is adaptable to light work. Sizes A-1, A-2 and A-3 differ only in the hoods. A-1, as shown, is provided with a wind-guard, A-2 has an open hood, and A-3 a closed hood. Sizes A-4, A-5, A-6 and A-7 have larger pans and are provided with a water tank. A-8 is heavier and has a hand blower, and is used extensively for stationary work. The B type is made in eight sizes and is particularly adaptable to mechanical laboratories of technical schools. The C forges are made in four sizes, and are fitted with a tight and loose pulley for belt connection; a continuous blast may be thus provided which can readily be regulated by means of a blast gate underneath the fire pan. For the lightest forge work, forges D and E are used. Of the E types the pan, tuyere and blower are like those of A but smaller; and the hand power attachment is arranged for bench work. With these forges there is a box to hold a comple-

ment of tools together with the forge itself; making it useful in repair work on account of the convenience of transportation. The F forge is made in three sizes and is like the type A forge except that it has shorter legs.

The type G forge shown in the accompanying illustration is made with either hand or stationary blast. The body is of heavy steel plate rigidly braced and provided with a wind-guard.

New York Eight-hour Law Killed.

In the suit of the People ex rel. Crossey, appellant, versus Controller Grout, of New York city, the New York State Court of Appeals has declared unconstitutional Chapter 415 of the Laws of 1897, which prohibits a



Sturtevant Portable Forge, No. G-2.

contractor from employing his men more than eight hours a day on city, county or State work. Since its enactment in 1897 this statute has been almost continually before the courts. The present decision reverses the lower courts and grants the appellant's application, though not entirely on the arguments advanced by his counsel. Judges O'Brien, Martin and Vann hold that the law is unconstitutional in that it deprives an individual of property without due process of law. Chief Judge Cullen, with Judge Werner concurring, simply follows the Rogers case in which the courts held that the statute was unconstitutional in so far as it involves the "prevailing rate of wages." Judge Cullen holds that the Rogers case has not been overthrown by the Supreme Court of the United States. In his conclusion the chief judge says: "I fear that the many outrages of labor organizations, or of some of their members, have not only excited just indignation, but at times have frightened courts into plain legal inconsistencies and into the enunciation of doctrines which, if asserted in litigations arising under any other subject than labor legislation, would meet scant courtesy or consideration. . . . In a dissenting opinion Judge Haight holds that the constitutionality of the law can be sustained by the fact that it is a police regulation in the interest of public health and morality.

Foreign Railroad Notes.

The Prussians last summer made experimental runs of heavy express trains through between Berlin and Breslau, 212 miles, without change of locomotive or engineman. This was resumed regularly in November with one train, and there is talk of running all express trains on this route in this way. No such long runs had been made in Prussia theretofore.

The Germans have engaged 750 Italians to work at the building of a new railroad in southwest Africa. They have also sent an engineering party to survey a line for an extension of their 2 ft. gage line to Windhoek to a junction with the Cape Colony railroads; but this extension, if built, is to be of the Cape gage—3 ft. 6 in.

The regular fares are very low in Belgium; round-trip tickets good for two days still lower; for \$3.90 you can ride all over Belgium all the time second class for five days, and for twice that money for 15 days. When tickets are about to expire the holders sometimes cannot squeeze into their train, and have to pay for lodging and buy a new ticket the next day.

The long railroad from Orenburg to Tashkend was so far completed that a train carrying a cavalry general ran through at the end of October, though it will not be opened for traffic for some time to come. A Russian military journal sees in it the only means by which the force on the Afghanistan border can be increased and supplied to the extent necessary should there be war on that frontier; which is doubtless true, and will be borne in mind in India.

The Pilgrims Railroad, from Damascus to Mecca, some 280 miles of which (out of a total of 1,150) are now open for construction trains, is built with a German for chief engineer, under whom are 17 Turkish, 12 German, five French, five Italian, two Austrian, one Belgian and one Greek engineers. The southern terminus line is now on the desert. Locomotives have come from Munich and from Belgium; passenger cars from Frankfort-on-Main and freight cars from Belgium.

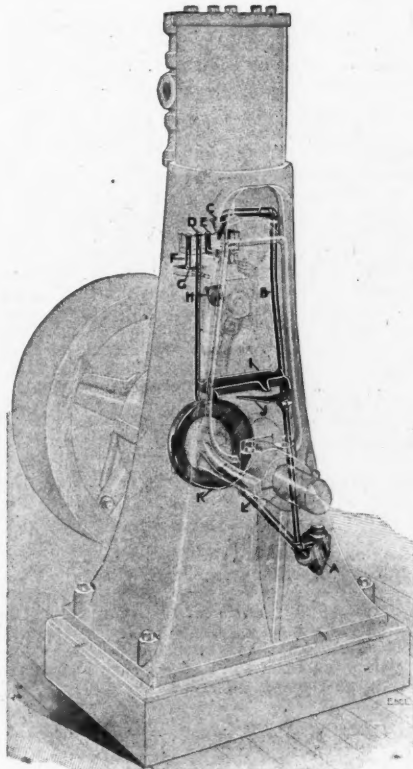
In 1903 the General Manager of the Japanese State Railroads, Dr. Soichiro Matsumoto, died at an early age, very much regretted. It was resolved as a memorial to him to establish in Tokio a railroad library, to be known as the "Matsumoto Library." Very large contributions to this library have been made by the Prussian Ministry of Public Works, the German Railroad Union, and various German manufacturers of railroad material, etc. These contributions, numbering some 400 volumes, besides photographs, were presented to the library through the German Minister to Japan.

The syndicate which made the experiments with electric high-speed trains on the Berlin-Zossen Military Railroad is to make further trials, but with steam locomotives, not to reach very high speeds, but to ascertain facts concerning resistance, etc. Two eight-wheeled baggage cars provided with instruments are to be pushed by a locomotive, and when a certain speed has been reached cut off and left to run till they stop. This will be done at different speeds and with varying loads on the axles. In this way it is expected to ascertain the frictional and the atmospheric resistance.

A New Design of Small Vertical Engine.

The small vertical engine illustrated herewith is a new design for which a number of features of merit are claimed. The most important is the oiling system, which is shown by the phantom perspective. The engine is entirely enclosed, which fully protects the working parts and at the same time presents a neat external appearance.

The oiling is entirely automatic, and instead of a drop or two a minute, each bearing has a stream of oil. The operation can be traced easily in the figure. An eccentric, K, on the shaft actuates the plunger, L, of the oil pump, A, forcing the oil up through the tube, B, into the small strainer, C. From C it drops into an oil box through the bottom of which four tubes project. In one side of each of these tubes there is a slot, so



Small Vertical Engine, American Blower Company.

that when the oil box contains only a small amount of oil, each tube can take its proper proportion. Two of these tubes, F and C, and two on the opposite side, not lettered, apply oil to the guides, the oil dropping into a small oil trench, G, from which it runs into the bearing through a small oil hole. The crosshead pin is supplied by the tube E, the oil dropping into the cup, H, and filling the cavity between the bolt and inside of crosshead pin and the oil grooves. The oil dropping from the crosshead is caught in two pans attached to the inside of the covers. From these oil pans it runs down the inside of the cover dropping into a cup in the top of the main bearing cap. Instead of oil grooves at the top and bottom of the main bearing, as ordinarily, in this system the bearing is cut away at the joint. When the thrust of the connecting rod is upward, the oil is carried to the bottom of the bearing, but when the load is reversed there are no oil grooves to carry away this oil. The crank-pin is oiled through the tube D. This tube discharges into a crank oil ring inside

the eccentric, K, which in turn discharges into the crank-pin oil tube, and flows across the crank-pin bearing. The crank-pin oil ring, in addition to its independent supply, catches the drip from one end of the main bearing. The eccentric is oiled by the drip, which it catches from the other end. No difficulty has been experienced in catching the oil thrown off of the eccentric strap, and the splash from the crosshead has been equally easy to take care of, the outside of the engine being entirely free from oil. A portion of the oil as it drops back into the bottom of the frame drops upon an oil filter. The large base gives the oil good opportunity to cool and settle.

Prior to placing the design on the market it was subjected to experiment and test for about two years. The following statement is made regarding the performance of one engine. It was adjusted and filled with oil on March 10th; up to July 15th no adjustments of any kind had been made, and no oil added except to fill the sight-feed cylinder lubricator. It ran from 14 to 16 hours a day driving a blower, and after a lapse of over four months needed no adjustment or fresh oil, running almost as noiselessly as at first.

The American Blower Company, Detroit, Mich., is the designer and builder of these engines, and recommends them particularly for applications requiring continuous service under heavy duty, such as driving blowers, dynamos, pumps and similar service.

Manufacturing and Business.

The city of Bloemfontein, Orange River Colony, South Africa, has voted \$500,000 to build a bridge.

The W. T. Young Bridge Co., of Nashville, Davidson County, Tenn., has been incorporated with a capital of \$10,000 by W. T. Young, J. R. Wilson, E. E. Freeland and others.

The Crane Company, of Chicago, maker of valves and steam fittings, reports say, has bought the business of the Young-Heintz Co., of Dallas, Tex., and will open a branch in that city.

The Victor Stoker Company, of Cincinnati, noticed in these columns Nov. 11, will redesign and perfect the Kincaid stoker and put it on the market when perfected as the Victor stoker.

The Fulton Co., Portland, has been incorporated in Maine with a capital of \$50,000 to make machinery. The officers are: President, W. M. Baldwin; Treasurer, J. J. Heron, and Clerk, M. W. Baldwin, all of Portland.

The American Steel Foundries Co. is reported to have received a contract to furnish bolsters for several thousand cars for the New York Central and for the Rock Island. The works at East St. Louis will be opened shortly.

The Pressed Steel Car Works at McKees Rocks, Pa., reports say, has resumed operations, giving employment to 300 men, and the number of men is to be increased until about 2,000 will be at work. The mills are to be run night and day at full capacity.

Mr. P. H. Wilhelm, formerly railroad representative of the American Steam Gage & Valve Manufacturing Co., of Boston, is now traveling in the east and south for the American Steel & Wire Co. of Chicago. Mr. Wil-

helm's headquarters will be at the New York office of the company in the Battery Park building.

The New England offices of the Allis-Chalmers Co., and the offices of the Bullock Electrical Manufacturing Co. have been consolidated and are now in the State Mutual building, 50 Congress street, Boston, under the management of Mr. George H. Berg.

A contract for building the Necaxa plant of the Mexican Light & Power Co., including upward of 2,000 steel towers, and for supplying all the steel work for the sub-stations, to cost about \$1,000,000, according to reports, has been let to a Pittsburg firm, probably the Riter-Conley Manufacturing Co., of that city.

The Government is to build 150 miles of lateral irrigation ditches, in Carson Sink Valley, Nevada. Bids for this work will be received prior to two o'clock p.m. December 15, 1904, either at the office of the Chief Engineer of the Reclamation Service, Washington, D. C., or at the office of the United States Reclamation Service, Hazen, Nevada.

Separate bids are wanted by the Board of Public Service of the city of Canton, Ohio, December 19, for one vertical triple-expansion pumping engine with a capacity of 12,000,000 gallons in 24 hours, three boilers with a capacity of 200 h.p. each, three smokeless furnaces or stokers, two 20-in. and two 30-in. hydraulic operative valves. L. B. Ohliger is Superintendent.

Sealed bids for building section 3 of the Washington street tunnel from a point near the north side of Boylston street to about 30 ft. north of the north side of Hayward place will be received by the Boston Transit Commission, 15 Beacon street, Boston, Mass., until 12 o'clock Thursday, Dec. 15, 1904. Plans and specifications may be obtained at the office. B. Leighton Beal, Secretary. See advertising columns.

Robert T. Mickle, M. E., announces that the Mickle-Milnor Engineering Co. has succeeded to his business as representative of H. R. Heinicke, Inc., designers and builders of radial hollow brick chimneys, and the Herron & Burg Manufacturing Co., maker of single and duplex air compressors, steam, electrical and belt driven and Monarch engine stops. The office of the new company is in the Drexel building, Philadelphia, Pa.

Bids are wanted for building the first six sections of the 1,000-ton barge canal by Charles S. Boyd, Superintendent of Public Works, Albany, N. Y., December 15, 16 and 17. The estimated cost of this portion of the work is \$5,000,000. The contracts include excavating on the Champlain Canal river channel, between Northumberland and Fort Miller, and from Crocker's Reef to Fort Edward, and on the land line below the Fort Miller lock from stations 147 to 262. On the Erie Canal the contracts include work along the Mohawk river, two locks, 4.83 miles of canal near Oneida Lake, an aqueduct over Seneca River, east of Savannah; and canal construction from station 2,571 west of Rochester, to station 2,744, near South Greece.

Dr. Louis Duncan, well known for his attainments in electrical work, has been retained by the Allis-Chalmers Company as an expert in electrical patent work in connection with its Electrical Department, the Bullock Electric Manufacturing Company of

Cincinnati. This connection has only recently been made possible by the retirement of Dr. Duncan from the Chair of Electrical Engineering at the Massachusetts Institute of Technology, to which he was appointed in 1892. Finding that it would be impossible to do justice to the institute, unless he gave up his constantly growing business as a consulting engineer and expert, Dr. Duncan decided to resign his chair. He will continue to make his headquarters in New York, at 56 Pine street.

Iron and Steel.

The Republic Iron & Steel Co., according to reports, has advanced the price of bar iron \$3 a ton to \$31, at Pittsburg.

The Wheeling & Lake Erie, it is reported, has let a contract for 1,000 tons of bridge material to the King Bridge Co., of Cleveland, Ohio, and the Michigan Central has ordered 1,400 tons of bridge material.

The New York & Jersey Co., which is building a tunnel under the Hudson river at New York, has ordered 10,000 tons of cast iron plates of Davies & Thomas, of Catasauqua, Pa., who also had a previous order from the same company for castings.

Reports from Pittsburg indicate that the United States Steel Corporation will have all its old furnaces and several new ones in full blast by January 1st. Sixteen thousand ovens in Connellsville are working full time and several thousand more will be started shortly.

Orders are reported as having been given for bridge material by the New York, Ontario & Western 3,000 tons, Pennsylvania 5,500, and the Chesapeake & Ohio 2,500; and by the Chicago & North Western, the Illinois Central, the Pittsburg, Fort Wayne & Chicago, and the Northern Pacific for about 17,000 tons.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies see advertising page 24.)

Railway Club of Pittsburg.

At the regular meeting of this club November 25, a paper was presented on "Automobile vs. Railway Transportation" by Paul Synnestvedt.

Canadian Society of Civil Engineers.

At the meeting of this society in Montreal November 24 there was a paper on "The Measurement of Water by the Venturi Meter" by R. Steckel.

Engineers' Club of Philadelphia.

At the meeting November 19, the nominating committee submitted for the coming year the name of S. G. Comfort for President, George Leiper for Vice-President, and Walter Loring Webb for Secretary. At the regular meeting of the club to be held December 3, a paper on "The Fremont Method of Determining the Fragility of Iron and Steel," with illustrations, will be presented by T. Y. Olsen.

National Association of Railroad Commissioners

The meeting of this association at Birmingham, November 15, was reported in the *Railroad Gazette* last week. Before adjourning, it was voted to hold the next convention at Deadwood, S. Dak., August 16, 1905. The

officers for the ensuing year are: President, Ira B. Mills, of Minnesota; First Vice-President, James H. Neville, of Illinois; Second Vice-President, W. G. Smith, of South Dakota, and Secretary, Edward A. Moseley, of Washington, D. C.

PERSONAL.

—Mr. Joseph W. Whittaker, for many years paymaster of the Boston & Lowell, died at his home in Arlington, Mass., on November 23, at the age of 75.

—Mr. Frank M. Quinlan, formerly and for a number of years Roadmaster on the Northern Pacific, died at Missoula, Mont., on November 22, at the age of 47.

—Mr. Charles H. Shipman, a prominent civil engineer, died in New York City on November 27, at the age of 61. He had assisted in surveying many lines of railroad and at one time was connected with the old Manhattan Beach Railroad.

—Mr. W. T. Eldridge, formerly Vice-President and General Manager of the Cane Belt Railroad, who has been on trial at Houston, Texas, on the charge of murdering Capt. William Dunovant, was, on November 22, acquitted, the jury holding that Mr. Eldridge's act was justifiable homicide. Since the shooting of Dunovant two attempts have been made to assassinate Eldridge, and in one of them he was shot through the body.

—Mr. W. S. Lang, Superintendent of the Tennessee Coal, Iron & Railroad Company, died on November 17, from the effects of a bullet wound received a few days previous. Mr. Lang was shot by an unknown person. On account of some trouble which he had had last spring with the union miners, frequent threats had been made against his life and the miners had tried to have him removed. He was shot while in company with a sheriff. He was searching for a fugitive lawbreaker.

—Mr. Lorenzo M. Johnson, President of the Pittsburg, Shawmut & Northern, and formerly General Manager of the Mexican International, died suddenly at St. Mary's Hospital in Pennsylvania on Monday, November 28. Mr. Johnson was born at Rochester, Mass., and was a graduate of the Sheffield Scientific School at Yale. At one time he was Vice-President of the St. Louis & Cairo and had been in railroad service since 1874. In that year he became Engineer of the Keokuk & Des Moines and was successively Chief Engineer, Acting General Superintendent and Assistant General Superintendent. In 1881 he resigned to go to the Pullman Company as Assistant to the President, and remained with that company about two years.

—Mr. Charles Scott, of Philadelphia, formerly President of the Charles Scott Spring Company, died at Overbrook, Pa., on November 23, at the age of 76. Mr. Scott was born in Ireland in 1828, but was brought to this country when very young. At the age of 17 he went to work for the wholesale saddlery hardware house of William P. Wilsback & Company, of Philadelphia, and in a few years became a partner, remaining in that business until 1876, when he started in the manufacture of car springs. In 1880 he associated with him Mr. C. T. Schoen, subsequently the inventor of the pressed steel car, and they formed the Charles Scott Spring Company. When this company was

merged into the Railway Steel Spring Company (1902) it was one of the largest of its kind in the country. Mr. Scott was prominent in the Methodist Episcopal Church, and he and his son, Charles Scott, Jr., recently gave \$100,000 to Wesleyan University as a memorial to his son, John B. Scott, who lost his life in the war with Spain.

ELECTIONS AND APPOINTMENTS.

Buffalo, Rochester & Pittsburg.—William T. Noonan has been appointed General Superintendent, with headquarters at Rochester, N. Y., succeeding the late J. H. Barrett. E. E. Davis, hitherto with the Ramapo Iron Works of Hillburn, N. Y., has been appointed Superintendent of Motive Power, with headquarters at Du Bois, Pa., succeeding F. T. Hyndman, resigned.

Canadian Pacific.—G. C. Wells has been appointed Assistant General Passenger Agent (Ontario Division), with office at Montreal, succeeding the late A. H. Notman.

A. Horfay has been appointed Mechanical Engineer, with office at Montreal, Que.

Chesapeake & Ohio.—The line, Cincinnati to Russell, is detached from the Kentucky Division and will comprise the Cincinnati Division, with E. P. Goodwin as Superintendent in charge. Mr. Goodwin's office will be at Covington, Ky. J. W. Haynes has been transferred to Ashland, Ky., as Assistant Superintendent of the Kentucky Division. J. R. Cary has been appointed Assistant to the Superintendent of the Huntington Division, with office at Hinton, W. Va., and D. E. Lahey becomes Assistant Superintendent of the New River Coal District, with office at Thurmond, W. Va., effective Dec. 1.

Chicago, Rock Island & Pacific.—R. R. Sutherland, Superintendent of the El Paso Division at Dalhart, Texas, has resigned.

Cincinnati, Hamilton & Dayton.—C. F. Basford, Advertising Agent, has resigned.

Colorado & Southern.—J. H. Young, hitherto General Superintendent of the Rio Grande Western, has been appointed General Superintendent of the C. & S., with headquarters at Denver, effective Dec. 1.

Detroit Southern.—J. H. Fraser has been appointed Assistant Superintendent.

Erie.—G. A. Heller, hitherto Superintendent of the Susquehanna and Tioga Divisions at Elmira, N. Y., has been appointed Superintendent of the Delaware Division, with headquarters at Port Jervis, N. Y., succeeding J. H. Taylor, resigned. W. J. Sharp, Superintendent of the Allegheny Division at Hornellsville, N. Y., has been transferred to succeed Mr. Heller, and Mr. Sharp in turn is succeeded by J. C. Tucker, Assistant Superintendent of the New York and Greenwood Lake Divisions and the Northern Railroad of New Jersey and the New Jersey & New York Railroads. M. C. Roach has been appointed to succeed Mr. Tucker at Jersey City.

Grand Trunk.—J. F. Jones has been appointed Superintendent of the St. Clair Tunnel and Terminals (Port Huron Tunnel and City, and Fort Gratiot Yards, in Michigan; also Sarnia Tunnel and City, and Point Edward Yards in Ontario), succeeding the late A. S. Begg. Mr. Jones's office will be at Port Huron Tunnel.

Manistee & Grand Rapids.—The officers of this company are: John Crocker, President; Max Toltz, Vice-President and General Manager; W. M. Simpson, Secretary; B. C. Sammons, Treasurer; Charles H. Morey, Traffic Manager, and Vail & Pain, General Counsel. The above named, ex-

cept Mr. Morey, are Directors of the company. W. J. Joyce is also a member of the Board.

Missouri, Kansas & Texas.—H. L. Satterlee, Counsel, has resigned.

New York, New Haven & Hartford.—J. A. Warner, Superintendent of the Highland Division, has been appointed Assistant General Superintendent, at New Haven; A. W. Martin, with same position, having jurisdiction in future over the Providence, Midland, Worcester, Taunton & Plymouth; B. R. Pollock, Superintendent of the Air Line-Norhampton Division, has been transferred to the Highland Division, succeeding Mr. Warner, and William Danills has been appointed to succeed Mr. Pollock; F. W. Brown, promoted from chief clerk to Assistant Superintendent of the New York Division.

Norfolk & Southern.—M. K. King, General Manager, has been elected Vice-President. On account of ill health the General Superintendent has been granted leave of absence. John Whetstone, hitherto Acting Superintendent of Motive Power, has been appointed Superintendent of Motive Power. The Auditor, G. M. Glazier, has been appointed Assistant to the General Manager, and W. B. Keys has been appointed Assistant to the General Manager.

Pere Marquette.—J. S. Pyeatt has been appointed Superintendent of the Buffalo Division, with headquarters at St. Thomas, Ont., succeeding William Woollatt, resigned on account of ill health. H. O. Halsted has been appointed Superintendent of Telegraph, with office at Detroit, succeeding Mr. Pyeatt.

Richmond, Fredericksburg & Potomac.—F. J. Duke, hitherto Assistant Treasurer, has been appointed Secretary and Treasurer, succeeding James B. Winston, resigned. Mr. Winston has held that position for over half a century.

Rio Grande Western.—J. H. Young, General Superintendent, has resigned. (See Colorado & Southern.)

Southern.—R. Clifton has been appointed Assistant General Freight Agent at Memphis, Tenn., succeeding R. L. McKellar.

Southern Pacific.—George T. Klink, Auditor at San Francisco, has resigned.

Tennessee Central.—J. H. Bannerman, Mechanical Superintendent, has resigned.

Toledo Railway & Terminal Company.—T. B. Fogg has been appointed General Manager, with headquarters at Toledo, Ohio, succeeding T. F. Whittelsey, resigned.

Toledo, St. Louis & Western.—Robert Williams, General Superintendent, has resigned.

LOCOMOTIVE BUILDING.

The Duluth & Iron Range will probably purchase four locomotives.

The San Pedro, Los Angeles & Salt Lake has ordered 50 locomotives from the Baldwin Locomotive Works.

The Central R. R. of New Jersey has ordered six locomotives from the Brooks Works of the American Locomotive Co.

The Buffalo, Rochester & Pittsburg has ordered five simple consolidation (2-8-0) locomotives from the American Locomotive Co. for December 15, 1905, delivery, cylinders 21 in. x 28 in.; diameter of drivers, 57 in.; working steam pressure, 210 lbs.; heating surface, 2,862 sq. ft.; 354 tubes 2 in. in diameter, and coal capacity, 12 tons.

The Chicago & Eastern Illinois, as reported in our issue of November 25, has ordered eight simple consolidation (2-8-0) and four 10-wheel compound (4-6-0) locomotives from the Baldwin Locomotive Works. The consolidation locomotives are for January 15, 1905, delivery. They will weigh 162,000 lbs.; cylinders, 21 in. x 28 in.; straight boiler with a working steam pressure of 200 lbs.; 268 tubes 2½ in. in diameter and 14 ft. 6 in. long; fire-box, 102 in. long and 66 in. wide; tank capacity, 6,000 gallons of water, and coal capacity, 12 tons. Details of the 10-wheel locomotives have not yet been fully decided.

The Chicago & Eastern Illinois has ordered six simple switching (0-6-0) and 10 simple consolidation (2-8-0) locomotives from the American Locomotive Co., instead of 12 locomotives as reported in our issue of November 18, for delivery about Dec. 25, 1904, and Jan. 1, 1905. The switching locomotives will weigh 142,000 lbs.; cylinders, 20 in. x 26 in.; diameter of drivers, 50 in.; working steam pressure, 180 lbs.; tank capacity, 5,000 gallons of water, and coal capacity, eight tons. The consolidation locomotives will weigh about 143,000 lbs., with 126,000 lbs. on the drivers; cylinders, 20 in. x 24 in.; diameter of drivers, 54 in.; straight boiler, with a working steam pressure of 200 lbs.; tank capacity, 5,000 gallons of water, and coal capacity, 10 tons.

The Boston & Maine, as reported in our issue of November 25, is having eight 10-wheel (4-6-0) passenger locomotives, 10 switching (0-6-0) engines and 10 simple Mogul (2-6-0) locomotives built by the American Locomotive Co. for May, 1905, delivery. The 10-wheel locomotives will weigh 170,000 lbs., with 128,000 lbs. on drivers; cylinders, 20 in. x 26 in.; diameter of drivers, 72 in.; extended wagon-top radial stay boiler, with a working steam pressure of 200 lbs.; heating surface, 2,833 sq. ft.; 342 tubes, 2 in. in diameter and 14 ft. 10 in. long; fire-box, 102 in. long x 65 in. wide, inside measurement; grate area, 46.27 sq. ft.; tank capacity, 5,000 gallons of water, and coal capacity, 10 tons. The Mogul locomotives will weigh 136,000 lbs., with 117,000 lbs. on drivers; cylinders, 19 in. x 26 in.; diameter of drivers, 63 in.; extended wagon-top radial stay boiler, with a working steam pressure of 200 lbs.; heating surface, 1,846 sq. ft.; 286 tubes, 2 in. in diameter and 11 ft. 8 in. long; fire-box, 108 3/16 in. long and 40 1/4 in. wide, inside measurement; grate area, 30.2 sq. ft.; tank capacity, 4,000 gallons of water, and coal capacity, 7 tons. Special equipment includes: Westinghouse-American air-brakes, Carnegie axles, Franklin 85 per cent. magnesia boiler lagging, Sterlingworth brake-beams, American Brake Shoe & Foundry Co.'s brake-shoes, Tower couplers, Dewey headlights, Hancock composite No. 8 and No. 9 injectors, U. S. metallic piston rod and valve rod packings, Ashton safety valves, Leach sanding devices, Michigan sight-feed lubricators, American Locomotive Co.'s springs, Economy Car Heating Co.'s steam-heat equipment, Midvale driving-wheel tires, Standard truck and tender wheels and cast-steel wheel centers.

The Harriman Lines have ordered 100 locomotives from the Baldwin Locomotive Works. This order is divided as follows: 10 simple switching (0-6-0) engines for the Union Pacific and four for the Oregon Short Line; four Pacific (4-6-2) locomotives for the Oregon Railway & Navigation Co.; 76 heavy consolidation (2-8-0) locomotives for the Southern Pacific and six for the Oregon Railway & Navigation Co. The switching engines will weigh 150,000 lbs.; cylinders 20 in. x 26 in.; diameter of drivers, 57 in.; straight boiler, with a working steam pressure of 180 lbs.; heating surface, 1,822 sq. ft.; 276 tubes 2 in. in diameter and 11 ft. 7 in. long; fire-box, 108 in. long and 40 1/4 in. wide; grate area, 30.2 sq. ft.; tank capacity 4,000 gallons of water and coal capacity, 6 tons. The Pacific locomotives will weigh 222,000 lbs., with 141,000 lbs. on drivers; cylinders, 22 in. x 28 in.; diameter of drivers, 77 in.; straight boiler, with a working steam pressure of 200

lbs.; heating surface, 3,054 sq. ft.; 245 tubes, 2½ in. in diameter and 20 ft. 1 in. long; fire-box, 108 in. long and 66 in. wide; grate area, 49.5 sq. ft.; tank capacity, 7,000 gallons of water, and coal capacity, 14 tons. The heavy consolidation locomotives will weigh 207,000 lbs., with 184,000 lbs. on drivers; cylinders, 22 in. x 30 in.; diameter of drivers, 57 in.; straight boiler, with a working steam pressure of 200 lbs.; heating surface, 3,297 sq. ft.; 413 tubes 2 in. in diameter and 15 ft. 1 in. long; fire-box, 108 in. long x 66 in. wide; grate area, 49.7 sq. ft.; tank capacity, 7,000 gallons of water, and coal capacity, 14 tons. Special equipment for all includes: Golmar bell ringers, Damascus 6-in. I-beam brake-beams, American Brake Shoe & Foundry Co.'s brake-shoes, Tower couplers, Nathan injectors, Hewitt Manufacturing Co.'s journal bearings, U. S. metallic piston rod and valve rod packings, Crosby safety valves, Economy sanding devices, Railway Steel-Spring Co.'s springs, Ashcroft steam gages, Consolidated steam heat equipment and standard steel tired driving, truck and tender wheels.

CAR BUILDING.

The Boston & Maine has ordered 300 tank cars from the Laconia Car Co.

Crerar, Clinch & Co., Chicago, has ordered 50 solid-end coal cars from the Pullman Co.

The Deepwater Railroad has ordered six flat cars from the American Car & Foundry Co.

The Mississippi Central has ordered 100 flat cars from the American Car & Foundry Co.

The Pittsburg Coal Company, Pittsburg, will build 200 coal cars of 80,000 lbs. capacity at its own shops.

The Hughes Creek Coal Company has ordered 20 gondolas from the American Car & Foundry Co.

The Harriman Lines are asking prices on 200 additional flat cars and 35 tank cars for the Union Pacific.

The Rodger Ballast Car Company, Chicago, has ordered 50 ore cars from the American Car & Foundry Co.

The Canadian Pacific has material for building 1,000 cars at its own shops and expects to build 1,000 additional cars.

The Chesapeake & Ohio has ordered 500 steel hopper cars of 100,000 lbs. capacity from the Pressed Steel Car Co.

The Detroit Chemical Works, Detroit, Mich., has ordered four 28-ft. 4,500-gallon tank cars from the American Car & Foundry Co.

The Duluth & Iron Range, reported in the market for cars in our issue of November 18, has ordered 300 gondolas from the Standard Steel Car Co.

The San Pedro, Los Angeles & Salt Lake has ordered 750 steel double hopper gondolas of 100,000 lbs. capacity from the Pressed Steel Car Co.

The Grand Trunk is asking bids on 1,000 freight cars, in addition to the 1,000 cars recently ordered from the Western Steel Car & Foundry Co.

The Pennsylvania has ordered 40 box cars from the American Car & Foundry Co., in addition to the order reported in our issue of November 4.

The Wisconsin Central, as reported in our issue of November 25, has ordered 500 standard 36-ft. box and 200 ballast cars from Haskell & Barker.

The Duluth, Missabe & Northern, reported in the market for cars in our issue of November 18, has ordered 800 gondolas from the Standard Steel Car Co.

The Escanaba & Lake Superior has ordered 25 wooden flat cars of 80,000 lbs. capacity from the American Car & Foundry Co. for January 1, 1905, delivery. These cars will be 41 ft. long and 8 ft. 9 in. wide. Special equipment includes Westinghouse air-brakes and Hein couplers.

The Harriman Lines have placed orders with the American Car & Foundry Co. for 750 box and 200 stock cars for the San Pedro, Los Angeles and Salt Lake, 300 box and 700 stock cars for the Southern Pacific, 300 box cars for the Oregon Railway & Navigation Co. and 300 stock cars for the Oregon Short Line. These cars will all have steel underframes, and the box cars will be of 100,000 lbs. capacity.

The Pennsylvania, as reported in our issue of November 4, has recently placed orders for 6,800 cars. This order includes: 3,000 class G gondolas, 40 ft. long, with steel underframes and 30 in. wooden sides and having a capacity of 100,000 lbs.; 2,400 class G1a self-clearing coal cars of 100,000 lbs. capacity; 700 class X1 box cars of 100,000 lbs. capacity, and 700 class Gpa coke cars of 100,000 lbs. capacity.

The Minneapolis, St. Paul & Sault Ste. Marie, as reported in our issue of November 18, is having four combination mail and express cars and 10 passenger coaches built by Barney & Smith for May and October, 1905, delivery. The passenger coaches will be 54 ft. 9 in. long and the combination mail and express cars will be 70 ft. long. Special equipment includes: Pullman wide vestibules and steel-tired wheels.

The Chicago & Eastern Illinois, as reported in our issue of November 18, has ordered 250 steel gondola cars of 100,000 lbs. capacity from the Western Steel Car & Foundry Co., for January, 1905, delivery. These cars will weigh 37,800 lbs. and measure 41 ft. 5 1/4 in. long, 9 ft. 3/4 in. wide and 4 ft. 1/2 in. high, all inside measurements. The special equipment includes: Simplex bolsters and brakebeams, Chicago couplers, Miner draft rigging, McCord journal boxes and lids and Western Steel Car & Foundry Co.'s wheels.

BRIDGE BUILDING.

BATTLEFORD, N. W. T.—The Canadian Northern will build a bridge at this place. Superintendent Pace, of Edmonton, will have charge of the work.

BILLOXI, MISS.—Bids are wanted December 7 for building a bridge over the Big Biloxi river.

BRIDGEPORT, CONN.—The New York, New Haven & Hartford has completed its iron bridge over the Pomerag river at Sandy Hook. The company will build a new three-span bridge between Shelton and Derby, carrying double tracks.

BUFFALO, N. Y.—The Aldermen have refused to accept the report of the aldermanic committee on bridges which voted to readvertise for new bids for the proposed bridge to be built over the Buffalo river at Ohio street and have asked for a second report. (November 11, p. 152.)

DANVILLE, KY.—The city is reported to have voted an issue of \$30,000 bonds for building a bridge. R. C. Brydon is City Clerk.

DAYTON, OHIO.—The Board of Public Service has authorized the asking of bids for the superstructure of Herman avenue river bridge.

DONORA, PA.—The Washington County Grand Jury has approved the finding of the joint Board of Viewers of Washington and Westmoreland Counties recommending that a free bridge be built over the Monongahela river between this place and Webster.

FORDS BLUFF, TEX.—The Gulf, Colorado & Santa Fe is planning, according to reports, to build a steel bridge over the Neches river to cost \$25,000 on its Gulf, Beaumont & Kansas City branch.

FREDERICTON, N. B.—The Commissioner of Public Works will receive bids December 12 for building Briggs Mill bridge, Wakefield.

HUNTINGTON, W. VA.—The Chesapeake & Ohio, according to local reports, is planning to build a bridge over the Ohio river.

HUNTSVILLE, ALA.—The Nashville, Chattanooga & St. Louis will soon build a bridge over the Tennessee river south of Byrd's Bluff. Surveys have been completed and the site of the bridge located.

INDIANAPOLIS, IND.—The Board of Public Works, reports say, is asking bids for building the abutments and middle piers for the Senate avenue bridge over Fall creek. The work of removing the Morris street bridge over White river has been commenced by Alexander Cohn, who bought the bridge, and the new concrete steel bridge, to consist of five spans with a middle span of 110 ft., two of 90 ft. each and two of 80 ft., with approaches aggregating 550 ft., will be built at once. The removal of the bridges at Michigan street and River avenue will also be commenced shortly and temporary bridges erected during the construction of the new bridges.

JASPER, ALA.—The Commissioners' Court of Walker County has granted permission to build a steel bridge which will be the largest in the county over the forks of the Mulberry and Sipsie rivers and the creek in the eastern portion of the county, and authorized the asking of bids for the work.

NASHVILLE, TENN.—At the January session of the State Legislature, an act will be introduced authorizing the city of Nashville to issue bonds for building a bridge with one center pier and an opening 200 ft. wide, with a roadway wide enough to carry double tracks, two driveways and 9-ft. sidewalks over the Cumberland river, to cost about \$250,000.

NEWKIRK, OKLA. T.—Bids are wanted December 19 by H. B. Davis, Deputy County Clerk, for building 12 steel bridges in Kay County.

PHOENIX, ARIZ.—The Maricopa & Phoenix Railroad is making surveys to locate a site for a steel bridge to replace an existing structure; and work on it is to be commenced next month.

PRINCE ALBERT, SASK.—Plans are being prepared for a highway bridge across the Saskatchewan river.

ST. JOSEPH, MICH.—A contract has been let to the Pan-American Bridge Co., of Greencastle, Ind., at \$18,498 for building the Napier bridge, and work will be begun at once.

SAVANNAH, GA.—The Mayor and Aldermen have been petitioned by residents to take action to insure the building of a bridge over the Savannah river.

ST. VINCENT, MINN.—The Northern Pacific is planning to build a bridge over the Red river between this place and Pembina.

TIVERTON, R. I.—The General Assembly has passed an act appropriating \$170,000 for the bridge at Tiverton to replace the present stone bridge.

TOLEDO, OHIO.—The Board of Public Service has petitioned the City Council to build a concrete steel bridge to replace the present

Cherry street bridge. The plans prepared by Chief Engineer Frank I. Consaul, of the Board of Public Works, call for a bridge of four spans each 156 ft. long with a rolling lift draw of 200 ft. and approaches over the west side in excess of 180 ft., to be 80 or 85 ft. wide and 30 ft. above the water.

WILKESBAERE, PA.—All objections which have prevented the building of the new Berwick-Nescopeck bridge connecting the counties of Columbia and Luzerne have been withdrawn.

WINNIPEG, MAN.—A large steel bridge is to be built over the Red river between St. Boniface and this place, the cost to be shared by the two corporations.

Other Structures.

BINGHAMTON, N. Y.—The Erie, local reports state, has plans ready for building a new passenger station here.

BOSTON, MASS.—The Boston & Maine is rebuilding the freight shed at pier No. 5, Hoosac tunnel docks, recently destroyed by fire. The new structure will be 500 ft. long and 14 ft. wider than the old shed.

COVINGTON, KY.—The Chesapeake & Ohio, local reports state, has decided on plans for a three-story brick building for its offices, to be 40x80 ft.

FORT WILLIAM, ONT.—The Canadian Pacific will soon ask bids for building an elevator at this place with a capacity of 2,000,000 bushels.

GRAND JUNCTION, COLO.—A stone station is to be built by the Denver & Rio Grande.

LINCOLN, NEB.—The City Council has granted a 50-year franchise to the Union Station & Terminal Co., which gives it the right to condemn property as a site for its station and the right of way for roads leading to it.

LOUISVILLE, KY.—The Louisville & Southern Indiana Traction Co., it is reported, has bought a site for its new passenger station, on which work is to be commenced at once.

MATTOON, ILL.—The shops of the Cleveland, Cincinnati, Chicago & St. Louis at Brightwood, Ind., and at this place, it is reported, will be enlarged at a cost of about \$500,000.

MEMPHIS, TENN.—Representatives of all the railroads entering this city are conferring as to the building of a union passenger station.

MINOT, N. DAK.—The new station of the Great Northern, which is to be built at once, is to be a one-story brick structure 40 x 240 ft.

NAVASOTA, TEX.—The Houston & Texas Central and the Gulf, Colorado & Santa Fe, local reports state, have agreed upon a site for a new union passenger station, on which work is to be commenced at once.

NEW ORLEANS, LA.—The St. Louis & San Francisco, local reports state, has given a contract to D. A. Barnes for putting up an office building three stories high, with steel frames and brick walls, 48 ft. x 100 ft., to cost \$25,000. It will be at St. Louis and Basin streets.

NEW YORK, N. Y.—An additional power station for the subway will be built on the east side of Hillside avenue south of Eleventh avenue. It will be of brick, two stories high, 103 ft. x 58 ft., to cost about \$100,000.

NOGALES, ARIZ.—The Southern Pacific, reports state, has plans ready for building a stone passenger and freight station 30 ft. x 210 ft., on which work is to be commenced soon.

PRINCETON, IND.—The Evansville & Princeton Traction Co., local reports state, has bought a site at State and West streets, on which a new brick station will be built.

SOMERSET, KY.—Local reports state that the Cincinnati Southern has decided to build shops for the system at this place, and that a steel frame building 137 x 377 ft. will soon be put up.

TERRELL, TEX.—The Texas Midland shops were destroyed by fire November 21, including the machine and paint shops and car sheds. A large amount of tools and machinery was also destroyed. The loss is estimated at \$50,000. The buildings will probably be rebuilt at once.

WEEHAWKEN, N. J.—Plans and specifications for a new grain elevator have been filed by the West Shore Railroad, to be built on pier No. 7. The elevator is to have a capacity of 3,000,000 bushels and will cost about \$923,843. The contractors are George and Arthur G. Molken, of Chicago.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ATCHISON, TOPEKA & SANTA FE.—A contract for building the extension from Owasso, Ind. T., to Tulsa, 12 miles, has been let to Robert Kincaid. The present southern terminus of the A., T. & S. F. is at Owasso. (October 14, p. 125.)

BOSTON ELEVATED.—An officer writes that this company is now arranging to build an elevated extension from Guild street, Boston, to Forest Hills, about 2½ miles. G. A. Kimball, 101 Milk street, Boston, is Chief Engineer.

BUFFALO & SUSQUEHANNA.—The newspapers say that grading has been resumed on this road between Stanley, N. Y., and Sykesville, two miles. The work is being done by Mason, Rosser & Co. This is part of the extension from Sinnemahoning, Pa., to Sykesville, N. Y., 56 miles. According to the contractors, work on this section will be completed in about two months. (June 17, p. 7.)

BUFFALO UNION TERMINAL.—Incorporation has been granted this company in New York State to build and operate a steam railroad seven miles long in Buffalo. The authorized capital is \$100,000 and the directors include: F. C. Mosedale, C. A. Collins and Bernard Marron, all of Buffalo.

CANADA SOUTHERN.—Application will be made at the next session of the Dominion Parliament for an act extending the time for completing this line and branches.

CHICAGO, ANAMOSA & NORTHERN.—This company has graded its line from a point about two miles northwest of Anamosa, Iowa, to Coggon, about 22 miles, and tracklaying on this portion is in progress. The line will eventually be extended through to Waterloo. Henry Kiene, Dubuque, Iowa, is President, and J. F. Lacord, Anamosa, Iowa, Chief Engineer. (November 11, p. 153.)

CHICAGO & CENTRAL ILLINOIS.—Articles of incorporation have been filed by this company in Illinois with an authorized capital of \$100,000. It is proposed to build a railroad from Chicago through Harvey, Homewood, Matteson and Pectons to Kankakee. W. R. Reed, C. F. Davies, W. H. Borris and M. W. Hamford, all of Chicago, are named as incorporators.

CHICAGO, BURLINGTON & QUINCY.—According to newspaper reports, this company has begun work on a number of passing tracks between Akron, Colo., and Lincoln, Neb. These tracks will be from one to two miles in length and will be placed at frequent intervals. It is also proposed to begin work soon on a second track between Denver and Akron.

CINCINNATI, NEW ORLEANS & TEXAS PACIFIC.—An officer writes that work is now in progress on an extension from Cardiff,

Tenn., to the Tennessee river, five miles. Grading is being done by the Roane Iron Co.

DUBLIN & SOUTHWESTERN.—Grading is progressing rapidly on this road from Rentzville, Ga., to Eastman, 17 miles, and track laying will probably be begun before the end of the year. It is promised that the line will be opened for traffic early in the spring. E. P. Rentz, Dublin, Ga., is President. (September 9, p. 87.)

DULUTH, MISSABE & NORTHERN.—A contract has been let to the Winston & Dear Contracting Co. for building a cut-off seven miles long from a point on the main line near Hibbing, Minn., in an easterly direction. The new line will shorten the present main line and will avoid the heavy grades of the Scott hills in the vicinity of Hibbing.

GREENVILLE & KNOXVILLE.—Press reports state that a contract has been let to O. Cauble to build this railroad from Greenville, S. C., to Riverview, 21 miles. The old roadbed of the Carolina, Knoxville & Western will be used between these points. Work is to be begun at once and the line will probably be in operation in about six months. H. M. Prince, Greenville, S. C., is President. (May 27, p. 410.)

INDIANAPOLIS, NEWCASTLE & TOLEDO (ELECTRIC).—Articles of incorporation have been filed by this company in Indiana with an authorized capital of \$3,500,000. It is proposed to build an electric railroad from Indianapolis through Newcastle to Winchester, 140 miles, with branch lines from Newcastle to Muncie and Richmond. The new company will absorb the Indianapolis, Newcastle & Winchester Railroad, recently incorporated, and the projected line between Muncie and Newcastle. D. M. Parry is President, and C. S. Hernly, Newcastle, Ind., is Vice-President and General Manager.

JASPER & EASTERN.—A contract has been let to the Lantry-Sharp Contracting Co., Gumbel building, Kansas City, Mo., for the grading, bridging and tracklaying on this proposed railroad from Kirbyville, Tex., to a point east of De Ridder, La., 50 miles. Work will be begun at once. It is the intention of the company to eventually extend the line to Alexandria, 35 miles further. This company is reported to have been incorporated in the interest of the Atchison, Topeka & Santa Fe. (November 25, p. 168.)

LIVE OAK & PERRY.—An officer writes confirming the report that this company will begin work in a few days on an extension from the present terminus in Lafayette County, Fla., through Perry and Hampton Springs to the Aucilla river, about 45 miles. No contracts for grading will be let, as the work will be done by the company's forces. Thomas Darling, Live Oak, Fla., is President. (November 25, p. 169.)

MANITOWOC, GREEN BAY & NORTHWESTERN.—Articles of incorporation have been filed by this company in Wisconsin. It is proposed to build a railroad from Manitowoc northwest through Eland Junction to Gillett, 125 miles. The company is said to have been formed in the interest of the Chicago & North Western.

MINNEAPOLIS & ST. LOUIS.—This company has begun work on 11 miles of road between Ruthven and Terril, Iowa. Ruthven is the northern terminus of the Des Moines & Fort Dodge, which was recently acquired by the Minneapolis & St. Louis, and Terril is a point on the Storm Lake branch of the M. & St. L. about seven miles southwest of Emmetsburg. It is stated that the new line will be finished by Jan. 1, 1905, the day on which the Des Moines & Fort Dodge becomes the property of the M. & St. L.

MINNESOTA ROADS.—A contract has been let to Halverson & Carlson, of Minneapolis, for building a new railroad from the present terminus of the line of the Red River Trans-

portation Co. at Nebish, Minn., to Bemidji. Under the terms of the contract, 10 miles of track must be finished by June 1, 1905, and the entire road must be completed by the end of July. Connection will be made at Bemidji with the Great Northern.

MOBILE & WEST ALABAMA.—An officer writes confirming the report that location surveys have been about completed for this railroad from Birmingham, Ala., southwest to Tuscaloosa, 50 miles. The work will be done by the Terry & Gahagan Construction Co., of 79 Wall street, New York. The maximum grade will be 1 per cent. north bound and .6 per cent. south bound and the maximum curvature will be 6 degrees. The work will include 10,560 lineal ft. of steel bridges and viaduct and 42,733 lineal ft. of tunnels. H. Austel, Mobile, Ala., is President, and J. A. Montgomery, First National Bank building, Birmingham, Ala., is Chief Engineer. (November 25, p. 169.)

MONROE & LAKE PROVIDENCE.—Application has been made for a charter for this company to build a railroad from Monroe, La., to Lake Providence, about 60 miles. It is stated that work will be begun as soon as a charter is granted, preliminary surveys having already been finished. A. A. Gunby, Monroe, La., is President; E. J. Hemley, Lake Providence, La., Vice-President, and H. D. Apgar, Secretary.

NEW BERLIN & WINNFELD.—Grading has been begun on this proposed road from Winfield, Pa., to New Berlin, eight miles. The work will be light with easy grades. I. C. Burd, Shamokin, Pa., is President. (October 14, p. 125.)

NEW YORK, NEW HAVEN & HARTFORD.—A contract for building a second track on the Naugatuck division from Waterbury south three miles has been let to the J. J. O'Brien Co. A contract has also been let to C. W. Blakeslee, New Haven, Conn., for building a second track on the Highland division from Hopewell Junction to West Pawling, four miles. (November 18, p. 161.)

NEW YORK, PENNSYLVANIA & SOUTHWESTERN.—A contract has been let to the Colonial Construction Co., 141 Broadway, New York, for building part of this proposed railroad from Williamsport, Pa., northeast to Binghamton, N. Y., 116 miles. Work on the Pennsylvania end is already in progress by the contractors, Rogers & Co., 15 Wall street, New York. D. E. Baxter, 277 Broadway, is General Manager. (November 4, p. 147.)

NORTHERN PACIFIC.—An officer writes denying the report that this company is planning to spend a large amount of money in lowering its tracks through Spokane, Wash. (November 18, p. 161.)

ST. JOSEPH, ALBANY & DES MOINES (ELECTRIC).—Surveys have been finished for this proposed electric road from Des Moines, Iowa, south through Polk, Warren, Madison, Union and Ringgold counties in Iowa and through Harrison, Worth, De Kalb and Buchanan counties in Missouri, a total distance of about 150 miles. Rights of way are now being secured and work will probably be begun early in the spring. F. S. Mordaunt is President, Wallace Hubbard, Vice-President, and E. H. McVey, Secretary. The headquarters of the company will be at Des Moines. (October 28, p. 140.)

ST. LOUIS SOUTHWESTERN.—Press reports state that it is the intention of this company to build an extension southeast to the Sabine river and eventually to Beaumont. Application has been filed with the Railroad Commission of Texas for authority to issue bonds on the extension from Lufkin southeast 26 miles to the amount of \$600,000. Twenty-two miles of this line was formerly the Texas & Louisiana railroad, and a length of four miles has recently been constructed. M. L. Lynch, Tyler, Tex., is Chief Engineer.

SOUTH BEND & SOUTHERN MICHIGAN.—This company has been incorporated in Michigan to build a railroad between Buchanan and Niles, five miles. It is stated that work will be begun as soon as the weather permits. (See Construction Supplement.)

SOUTHERN.—An official is reported as saying that this company will extend the second track west of Atlanta, Ga., 11 miles to Austell, and also that a second track will be built in the coal districts west of Birmingham, Ala. No statement is made as to when the contracts for this work will be let.

WASHINGTON & GREENE.—Press reports state that surveys are in progress by this company, which proposes to build a road from the Monongahela River to the Ten-mile coal field. The proposed road will be standard gage and will open up eight new coal mines. It will connect with the Monongahela division of the Pennsylvania and with the Pittsburg & Lake Erie. R. M. McKinney is in charge of the surveys.

YAZOO & MISSISSIPPI VALLEY.—Bids are now being received by this company for building an extension from Mattson to Roundway, Miss., three miles. A. S. Baldwin, Chicago, is Engineer of Construction.

RAILROAD CORPORATION NEWS.

BUFFALO, ROCHESTER & PITTSBURG.—At a recent meeting of the stockholders of this company a proposition to increase the common stock from \$9,000,000 to \$12,000,000 was approved. The proceeds from the sale of this stock will be used to complete the Indiana branch and for other capital requirements.

BUFFALO SOUTHERN.—The New York State Board of Railroad Commissioners has authorized this company to issue a mortgage for \$2,000,000 with the proviso that only \$1,000,000 of the bonds shall be issued at this time, and that the additional consent of the board must be obtained before the remaining \$1,000,000 may be issued.

CLEVELAND & PITTSBURG.—The Pennsylvania Railroad has awarded 80,000 shares of the Cleveland & Pittsburg guaranteed 4 per cent. stock to Kuhn, Loeb & Co., of New York. The price paid was \$52.88½, the par value being \$50 per share. The sale of this stock will net the Pennsylvania about \$4,238,000, and the money will be used for improvements on the main line of the C. & P.

CHICAGO, BURLINGTON & QUINCY.—J. P. Morgan & Co. have bought \$20,000,000 of the Illinois Division 4 per cent. bonds of which \$85,000,000 were originally authorized. These bonds will be used to refund a similar amount of consolidated first mortgage bonds issued in 1873, which fell due in 1903 but were extended until July, 1905. The Illinois Division bonds are a first lien on 743 miles of road, and a second lien on 897 miles. After the retirement of several underlying liens which mature at various periods this and next year, the bonds became a first mortgage on 1,650 miles of road, all east of the Mississippi.

CONEY ISLAND & BROOKLYN.—At a meeting of the stockholders of this company on November 29, the plan of the directors to issue \$10,000,000 50-year gold bonds was approved. It is stated that the proceeds from the sale of this issue will be used for retiring outstanding obligations which mature early in 1905, and for improvements.

DETROIT, MONROE & TOLEDO SHORT LINE (ELECTRIC).—This company has recently opened its line between Detroit and Toledo, 58 miles. Connection is made at Toledo with the Lake Shore Electric for Cleveland. The intention of the company is to run cars over the 175 miles between Cleveland

and Detroit in 6½ hours. *The Commercial and Financial Chronicle* says that except where the road passes through the city of Monroe, it is built on private right of way. The entire roadbed is rock ballasted and the bridges are all of steel. Between Detroit and Wyandotte there is a double track.

GRAND TRUNK PACIFIC.—A contract has been signed in London between Speyer Bros. and the Grand Trunk Pacific. According to the terms of the contract, Speyer Bros., London, and Speyer & Co., New York, will finance this railroad and will shortly offer \$6,600,000 4 per cent. first-mortgage bonds on the Lake Superior division and \$8,000,000 4 per cent. bonds on the Prairie division, running for a period of 50 years.

ILLINOIS CENTRAL.—N. W. Harris & Co., New York, are offering \$1,500,000 Illinois Central, Omaha Division, 3 per cent. bonds, due August 1, 1951. These bonds are secured by a first mortgage on the Omaha division.

INTERBOROUGH RAPID TRANSIT (NEW YORK CITY).—The east side division of the subway, from 96th street to 145th street, was opened for business on November 24. The tunnel beneath the Harlem river is not yet finished, but that part of the line north of the river, which is on an elevated structure (149th street northward) has been put in operation, and the trains are run to and from the southern part of the city over the lines of the Manhattan Elevated, there being a connection between the Manhattan tracks and those of the Rapid Transit lines at 149th street.

MANHATTAN ELEVATED (NEW YORK).—The Interborough Rapid Transit Co., lessee of the Manhattan lines, has agreed to pay on Jan. 1, 1905, to the stockholders of the Manhattan, a dividend of ¾ per cent. This makes the total dividend for the current year 7 per cent. To avoid the adoption of an expensive system of counting the passengers and the bookkeeping that a division of fares on a mileage basis would require, the directors of the two companies have concluded to anticipate by a year the date when the absolute guaranty of 7 per cent. dividend on the stock of the Manhattan irrespective of earnings, shall become effective.

NEW YORK, PENNSYLVANIA & SOUTHWESTERN.—This company, which proposes to build a line from Williamsport, Pa., to Binghamton, N. Y., 116 miles, has filed a mortgage with the Knickerbocker Trust Co., of New York, as trustee, securing an issue of \$4,500,000 50-year 5 per cent. gold bonds. The general office of the company is at 74 Broadway, New York City. Contracts for grading have already been let and work is in progress.

PHILADELPHIA & READING.—The New York Stock Exchange has authorized the listing on December 1 of the \$28,000,000 non-cumulative 4 per cent. first preferred stock, \$42,000,000 non-cumulative second preferred stock, and \$70,000,000 common stock. This stock is to be listed as the result of the recent dissolution of the voting trust.

RICHMOND, FREDERICKSBURG & POTOMAC.—The report of this company for the fiscal year ending June 30, 1904, shows gross earnings of \$1,522,332, as against \$1,338,904 in 1903. Operating expenses were \$1,021,501, an increase of \$80,979, leaving an increase in net earnings for the year of \$102,459. During the fiscal year, the bonded debt was increased by the issue of \$2,300,000 3½ per cent. 40-year gold bonds. The proceeds from the sale of these bonds went for double tracking and the purchase of real estate. With the exception of a few miles, the line now has a second track its whole length from Richmond, Va., to Quantico. For a description of this work, see our issue of April 1, page 252.



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EDITORIAL ANNOUNCEMENTS:

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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.

FRIDAY, DECEMBER 2, 1904.

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